LAB SUPPORT SERVICES
501457X

LORAIN

POWER EQUIPMENT

INSTRUCTIONS

INSTALLATION

OPERATION

MAINTENANCE

RELIANCE COMM/TEC

LORAIN® MODEL 200CBX

-48V POWER BOARD

Spec. No. 5821-052 Serial No. 275

This Power Board includes equipment per Assembly Drawing J-5821-052 and is assembled per Outline Drawing _____ as follows:

Quantity	List	Equipment	
	1	50A	Common equipment, wiring and assembly for one -48V Power Board
	2	100A	
/	3	200A	
	4	300A	
/	5	Supplemental Relay Rack	
	6	Heat Baffle	
	7	RL50F50	Rectifier, 60 Hz
/	8	RL100F50	
	9	RHM200D50	
	10	RL50F50	Rectifier, 50-60 Hz
	11	RL100F50	
	12	RHM200C50	
/	13	WAA501B	Inverter E/W #1 Transfer Circuit
	14	WAA102B	
	15	WAA202B	

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If the problem has been created by misuse or abuse of the equipment or by malfunction of associated equipment or by environmental conditions, at any time after shipment, the customer will be billed for circuit component and labor.

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LORAIN® MODEL 200CBX -48 VDC POWER BOARD SPEC. NO. 5821-052

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1. DESCRIPTION

General

1.01 The LORAIN® Model 200CBX is a -48 VDC power board having a maximum current capacity of 50, 100, 200, or 300 amperes. The 200CBX is designed to be used in conjunction with FLOTROL® Rectifiers, DependAC® Inverters, and a 24 cell, lead-acid type battery.

1.02 The 200CBX is equipped with a meter, control, and distribution panel. This panel contains an ammeter, rectifier reference fuses, control fuses, distribution fuses, low voltage disconnect, automatic equalize control, and alarm circuitry.

DC Distribution

1.03 DC distribution is provided through six 40-ampere fuses located on the meter, control, and distribution panel. A seventh fuse is also supplied to allow fusing of the input to a DependAC inverter.

Low Voltage Disconnect

1.04 The low voltage disconnect circuit is a battery protection circuit designed to disconnect the loads from the battery and rectifier(s) in the event that the output voltage decreases below 42.0V, as in during an AC power failure. Once the battery voltage reaches 49.0V, the low voltage disconnect circuit will reconnect the loads to the battery and rectifier(s).

Automatic Equalize

1.05 The automatic equalize control circuit provides an automatic control, as well as manual control of the equalize charge mode for FLOTROL Rectifiers equipped with remote equalize terminals. When the current

delivering ability of the rectifier is lost and the battery voltage decreases below normal float voltage limits, a timing circuit of the equalize control assembly is activated. When the rectifier becomes operational again and can supply current, the automatic equalize control assembly will have the rectifier deliver an equalize voltage for approximately three, six, or nine times the duration that the timing circuit of the equalize control assembly was activated. This assembly also provides a rectifier fail alarm circuit, which is activated in the event of a failure in any rectifier associated with the power board or loss of the automatic equalize control fuse.

Audible/Visual Alarm

1.06 The audible/visual alarm circuit supplies an audible tone alarm in conjunction with a visual indicator in the event of abnormal operating conditions: blown rectifier reference fuse, blown control fuse, blown distribution fuse, failed rectifier or a failed inverter. The audible portion of the alarm can be disabled after an alarm condition has occurred. A visual indicator will illuminate to indicate when the audible alarm has been disabled.

External Office Alarms

1.07 A common alarm termination terminal block, located on the meter, control, and distribution panel, is supplied for connecting external office alarms to extended open and closed contacts of the inverter fail, rectifier fail, and fuse fail alarm circuits.

2. TEST APPARATUS

2.01 The test equipment listed below is sufficient to perform any test or adjustment procedure detailed in this instruction manual:

Description	Model
Variable DC supply, 35-60 VDC, capable of one ampere	
Multimeter	Triplett Model 630A, or equivalent
Insulated Screwdriver	GC Electronics Type 8728A, or equivalent

3. INSTALLATION

Mounting

3.01 The 200CBX Power Board is mounted in a 7' by 24" relay rack.

Electrical Connections

3.02 All inter-panel electrical connections have been made at the factory. The installer is to make all other connections as required; these are shown on the power board wiring diagram, T-5821-052.

External Office Alarm Connections

3.03 Extended relay contacts are available at TB1 on the meter, control, and distribution panel. The alarm connections are to be made in accordance with office requirements. The alarm wiring is shown on the power board wiring diagram, T-5821-052.

a) Inverter Fail Alarm: An inverter fail alarm is indicated by a closed circuit between terminals 2 and 3, and an open circuit between terminals 1 and 2 of TB1.

b) Rectifier Fail Alarm: A rectifier fail alarm is indicated by a closed circuit between terminals 4 and 5, and an open circuit between terminals 5 and 6 of TB1.

c) Fuse Fail Alarm: A fuse fail alarm is indicated by a closed circuit between terminals 7 and 8, and an open circuit between terminals 8 and 9 of TB1.

Initial Startup and Checkout

3.04 After all electrical connections have been made and checked, the power board can be put into operation by turning on the AC input circuit breaker on each rectifier, and the DC input circuit breaker on the inverter supplied with the power board.

3.05 The rectifier and inverter portion of the power board is factory adjusted and readjustment is not normally required. Should readjustment become necessary, refer to the separate rectifier and inverter instruction manuals supplied.

3.06 Meter Check: The power board is equipped with an ammeter. A visual check of this meter while the power board is operating is recommended to assure that the meter is working properly.

3.07 Low Voltage Disconnect: Perform the following procedure to check for proper operation of the low voltage disconnect circuit located on the meter, control, and distribution panel:

a) Remove control fuse B from the meter, control, and distribution panel.

b) Connect a variable DC power supply to pins C (negative) and S (positive) of A1 (4863-024).

WARNING

Input voltage polarity to the low voltage disconnect circuit is critical. Exercise caution that the correct polarity connections from the DC supply are made.

c) Adjust the power supply to 52 volts. Contactor K1 should be operated. Slowly adjust the power supply to below 42 volts. Contactor K1 should release at 42 volts. Slowly adjust the power supply to above 49 volts. Contactor K1 should operate at 49 volts. If the above limits are not satisfied, refer to Section 1946 for adjustment procedures.

d) Remove the power supply from A1. Replace control fuse B.

3.08 Automatic Equalize: The following test procedure will verify correct operation of the automatic equalize circuit located on the meter, control, and distribution panel:

a) Turn off the AC input circuit breaker on each rectifier.

b) Remove control fuse C from the meter, control, and distribution panel.

c) Connect a variable DC power supply to terminal block TB10 terminal 7 (negative) and terminal 1 (positive) of A3 (4843-826).

WARNING

Input voltage polarity to the automatic equalize circuit is critical. Exercise caution that the correct polarity connections from the DC supply are made.

d) Adjust the DC supply to 52 volts.

e) On the rectifier which is controlled by the automatic equalize circuit, set the float/equalize switch to the float position. The float and equalize voltage adjustment potentiometers should be set for normal output voltages. Operate the AC input circuit breaker of the rectifier to the ON position.

f) Momentarily operate the EQUALIZE switch on the power board to the RESET position. The equalize lamp on the rectifier should extinguish. Wait at least 30 seconds before proceeding with the next step.

g) Operate the AC input circuit breaker on the rectifier to the OFF position to simulate a rectifier failure. The RECT FAIL indicator on the power

board will illuminate. Slowly decrease the output voltage of the DC supply until the AUTO EQ indicator illuminates, indicating that the automatic equalize circuit is operating.

NOTE

The output voltage of the DC supply should be at least 2 volts below normal float voltage of the battery. If this range cannot be attained, refer to the adjustment procedure in paragraph 5.03.

h) The AC input power to the rectifier should be interrupted for a minimum of 30 seconds. After this time period has elapsed, operate the AC input circuit breaker of the rectifier to the ON position. The RECT FAIL indicator will extinguish. The AUTO EQ indicator will remain illuminated to indicate that the rectifier is operating in the equalize charge mode. The rectifier should deliver equalize voltage for a time period of approximately three, six, or nine times the duration that AC input power was interrupted.

i) After the equalize charge time has expired, the rectifier will return to the normal float mode of operation. This will be indicated by the AUTO EQ indicator extinguishing.

j) Remove the power supply connected to A3. Replace control fuse C.

3.09 Alarms: Perform the following procedure to check for the proper operation of the alarm circuits located on the meter, control, and distribution panel:

a) Fuse Fail: To check the fuse fail alarm circuits, remove a good alarm-type fuse located above any one of the distribution fuses and replace it with an open fuse. A circuit will close between terminals 7 and 8, and a circuit will open between terminals 8 and 9 of TB1. The FUSE FAIL indicator will illuminate and an audible alarm will activate, indicating a failure has occurred. Operate the audible/visual alarm switch momentarily to the ALARM CUTOFF position. The audible portion of the alarm will cease, but the FUSE FAIL indicator will still be illuminated. Momentarily operate the audible/visual alarm switch to the MANUAL RESET position. The audible portion of the alarm will again be activated. Replace the open fuse with a good fuse. A circuit will open between terminals 7 and 8, and a circuit will close between terminals 8 and 9 of TB1. The FUSE FAIL indicator will extinguish, and the audible alarm will cease.

b) Inverter Fail: To check the inverter fail alarm circuit when an inverter is supplied with the power board, manually turn off the DC input circuit breaker of the inverter. A circuit will close between terminals 2 and 3, and a circuit will open between terminals 1 and 2 of TB1. The INVR FAIL indicator will illuminate and an audible alarm will activate, indicating a failure has occurred. Operate the audible/visual alarm switch momentarily to the ALARM CUTOFF position. The audible portion of the alarm will cease, but the INVR FAIL indicator will still be illuminated. Momentarily operate the audible/visual alarm switch to the MANUAL RESET position. The audible portion of the alarm will again be activated. Restart the inverter by placing the DC input circuit breaker to the ON position. A circuit will open between terminals 2 and 3, and a circuit will close between terminals 1 and 2 of TB1. The INVR FAIL indicator will extinguish, and the audible alarm will cease.

c) Rectifier Fail: To check the rectifier fail alarm circuit when a rectifier is supplied with the power board, manually turn off the AC input circuit breaker on the rectifier. A circuit will close between terminals 4 and 5, and a circuit will open between terminals 5 and 6 of TB1. The RECT FAIL indicator will illuminate and an aud-

ible alarm will activate, indicating a failure has occurred. Operate the audible/visual alarm switch momentarily to the ALARM CUTOFF position. The audible portion of the alarm will cease, but the RECT FAIL indicator will still be illuminated. Momentarily operate the audible/visual alarm switch to the MANUAL RESET position. The audible portion of the alarm will again be activated. Restart the rectifier by placing the AC input circuit breaker to the ON position. A circuit will open between terminals 4 and 5, and a circuit will close between terminals 5 and 6 of TB1. The RECT FAIL indicator will extinguish, and the audible alarm will cease.

4. OPERATION

General

4.01 The 200CBX power board functions as a distribution center for -48 VDC power. DC power from the battery and rectifier(s) is applied to the power board where it is distributed to various DC loads. Provisions are also made to supply DC power to an inverter associated with the power board.

NOTE

All controls and indicators of this power board are located on the meter, control, and distribution panel.

Automatic Equalize

4.02 When the EQUALIZE switch is in the AUTO position, the rectifier(s) is automatically transferred to the equalize mode of charging when necessary. The AUTO EQ indicator will illuminate when this occurs. After the equalize charge time has expired, the rectifier(s) will automatically be returned to the normal float mode of operation and the AUTO EQ indicator will extinguish. To return the rectifier(s) to the float mode of operation before the equalize charge time has elapsed, momentarily place the EQUALIZE switch in the RESET position. Placing the EQUALIZE switch in the MAN position will provide manual control of the equalize charge mode of operation and cause the MAN EQ indicator to illuminate. The RECT FAIL indicator will illuminate in the event of a failure in any rectifier associated with the power board or a failed equalize control fuse.

4.03 The automatic equalize control circuit can provide equalize charging for three, six, or nine times the duration that power from the rectifier(s) was interrupted and battery voltage was below the normal float voltage limits. This time selection is accomplished by operating the rockers on the DIP switch (S2) located on the 4843-826 printed circuit card. Refer to SD4843-826 for the DIP switch combinations required for selecting the equalize charge time desired. The automatic equalize control circuit permits a maximum equalize charge time of approximately 300 hours when set for the X3, 300 hours when set for the X6, and 270 hours when set for the X9 period of equalize charge time.

Audible/Visual Alarm

4.04 The audible/visual alarm circuit supplies an audible tone in conjunction with a visual alarm indicator when the audible/visual alarm switch is in the NOR position and an alarm condition occurs. There are three visual alarm indicators associated with this circuit:

a) The INVR FAIL indicator illuminates in the event of a failure in an inverter associated with the power board.

b) The FUSE FAIL indicator illuminates in the event of a blown rectifier reference fuse, blown control fuse, or a blown distribution fuse.

c) The RECT FAIL indicator illuminates in the event of a failure in a rectifier associated with the power board.

4.05 When an alarm condition occurs, the audible portion of the alarm circuit can be disabled by momentarily placing the audible/visual alarm switch in the ALARM CUTOFF position. This causes the ACO GD indicator to illuminate. The visual alarm indicator will remain illuminated as long as the alarm condition is present. To enable the

audible portion of the alarm assembly once it has been disabled and while an alarm condition still exists, momentarily place the audible/visual alarm switch in the MANUAL RESET position. This causes the ACO GD indicator to extinguish. When the alarm condition is corrected, the visual alarm will extinguish and the audible alarm will cease.

Metering

4.06 An ammeter is provided to indicate the total load current of the power board.

External Alarms

4.07 This power board provides terminals for connection of external inverter fail, rectifier fail, and fuse fail alarm circuits. Refer to paragraph 3.03 for identification of these terminals.

5. ADJUSTMENTS

5.01 The rectifier and inverter portion of the power board is factory adjusted and readjustment is not normally required. Should readjustment become necessary, refer to the separate rectifier and inverter instruction manuals supplied.

Low Voltage Disconnect Circuit Card (A1)

5.02 The low voltage disconnect adjustments have been factory set to the limits indicated on the schematic diagram. Should readjustment become necessary, refer to Section 1946.

Automatic Equalize Circuit Card (A3)

5.03 Potentiometer R24 on circuit card 4843-826 (A3), located on the meter, control, and distribution panel, is factory set to initiate equalize charge operation of the controlled rectifier(s) when battery voltage decreases to 50.0 volts. It is recommended that no change be made to this adjustment setting; however, in the event readjustment becomes necessary, proceed as follows:

a) Turn off the AC input circuit breaker on each controlled rectifier.

b) Remove control fuse C from the meter, control, and distribution panel.

c) Connect a variable DC power supply to terminal block TB10 terminal 7 (negative) and terminal 1 (positive).

WARNING

Input voltage polarity to the automatic equalize circuit is critical. Exercise extreme caution that the correct polarity connection from the DC power supply are made.

d) Adjust the DC power supply to a level 2 volts below normal battery float voltage.

e) Connect the test probes of a multimeter, set to indicate DC voltage, to test point TP1 (+) and terminal 3 (-) of TB8 on A3.

f) Adjust potentiometer R24 counterclockwise until the voltage indicated on the multimeter decreases to zero volts. Adjust potentiometer R24 clockwise to increase the voltage indicated on the multimeter to a level of 11.78 to 13.02 volts DC.

g) Remove the multimeter test probes and the DC power supply. Replace control fuse C and return each rectifier to normal operation.

6. CIRCUIT DESCRIPTION

Low Voltage Disconnect

6.01 The low voltage disconnect circuit is comprised of a contactor and a voltage control relay circuit card A1 (4863-024) located on the meter, control, and distribution panel. During normal operation, the contactor is held energized through relay contacts of the voltage control relay (VCR) on plug-in printed circuit card A1. During a low voltage condition, the contactor is deenergized thus breaking the current path from the battery and rectifier(s) to the loads. Refer to Section 1946 for more details on the operation of the voltage control relay circuit card A1.

Fuse Alarm

6.02 Any open fuse of this power board causes a parallel connected alarm-type fuse to open and supply resistive battery to operate the fuse alarm relay K2. Relay K2 provides open and closed contacts for external fuse fail alarms.

Audible/Visual Alarm

6.03 The audible/visual alarm circuit is comprised of circuit card A2 (4861-030). Negative 48V input battery is provided at J1-10. Negative battery is provided through R6 at J1-9 to one side of an audible alarm. The other side of the audible alarm is connected to J1-11. When an alarm condition occurs, ground is supplied at either J1-1 (when a rectifier fail alarm occurs), J1-2 (when a fuse alarm occurs), or at J1-4 (when an inverter alarm occurs). This causes an associate light emitting diode (LED) to illuminate and also provides ground at J1-11 to activate the audible alarm. Momentarily placing S1 in the ALARM CUTOFF position will energize relay K1. Ground will be removed from J1-11 through relay contacts of K1 , disabling the audible alarm. Ground will be supplied through relay contacts of K1 to illuminate the ACO GD LED, DS5. Ground will also be supplied through relay contacts of K1 to sustain K1 in the energized position after S1 is released. Momentarily placing S1 in the MANUAL RESET position will cause relay K1 to drop out. Ground will be again supplied to J1-11 through relay contacts of K1, activating the audible alarm. Ground will be removed through relay contacts of K1, to extinguish the ACO GD LED, DS5. When the alarm condition is corrected, ground will be removed from either J1-1, J1-2 or J1-4, extinguishing the associated LED. Relay K1 will deenergize regardless of its previous state in order to ready the circuit for the next alarm condition.

Automatic Equalize

6.04 The automatic equalize circuit is comprised of circuit card A3 (4843-826). Negative 48 volt battery is applied to TB10 terminal 7, and ground is applied to TB10 terminal 1. When battery voltage is below the float voltage limit, adjustable with R24, and the rectifier is not delivering current, a set current is sent through M1 by action of the transmission gates, A3, turning off Q1 and turning on Q2 and Q3. Transistor Q3, conducting, illuminates the AUTO EQ LED and operates relay K1 and K2. These relays provide type C sets of contacts to operate the remote equalize feature of up to eight rectifiers.

6.05 When the rectifier resumes current delivering ability, the circuit will send a current of opposite polarity through M1 resulting in Q3 remaining on for a period of time selected by switch S2 to give 3, 6, or 9 times the duration that the battery was below float level and the rectifier was off. After the equalize time has expired, the circuit will return to normal causing the AUTO EQ LED to extinguish and relay K1 and K2 to drop out. At this point, the rectifier will return to the float mode of operation.

6.06 Momentarily placing S1 in the RESET position causes the rectifier to return to the float mode of operation before the equalize time has expired. When the circuit is reset, it must stay in the normal mode for approximately two minutes to allow internal circuitry to reset itself before another alarm is turned in.

6.07 An internal timer, also set by S2, will terminate the off timing cycle after 100 hours for an X3 period, 50 hours for an X6 period, and 30 hours for an X9 period, which allows a maximum equalize time of approximately 300 hours for an X3 period, 300 hours for an X6 period, and 270 hours for an X9 period.

6.08 When S1 is placed in the MAN position, the rectifier equalize charge mode is controlled manually. The MAN EQ LED will illuminate and relay K1 and K2 will operate. Relay contacts of K1 and K2 will operate the remote equalize feature of the rectifier until S1 is returned to the AUTO EQ position.

6.09 Failure of fuse F1 or presence of battery on terminal 1 of TB1 through TB8 will

illuminate the RECT FAIL LED and operate relay K3. Contacts of relay K3 provide 3 sets of C type contacts on terminal block TB9. One set is extended to TB1 of the meter, control, and distribution panel for connection to external alarms. A second set is used to activate the audible/visual alarm circuits.

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INSTRUCTIONS

LORAIN® HIGH AND LOW VOLTAGE CONTROL RELAY ASSEMBLY

FOR USE IN 12, 24, 48, 60, or 130 VOLT DC POWER SYSTEMS

1. DESCRIPTION

1.01 The LORAIN® Voltage Control Relay (VCR) Assembly is designed to provide voltage control in 12, 24, 48, 60, or 130 volt DC power systems, depending upon the assembly furnished.

1.02 The energize and release values shown in Table 1 are normally furnished unless otherwise specified on original order or related application circuits.

1.03 The VCR relay contacts provide 2 independent open or closed loop circuits and 2 open or closed circuits with common armature contacts which can be connected as needed.

2. INSTALLATION

2.01 A printed circuit card socket is provided on the associated equipment panel which will accept the printed circuit card assembly. A one or 1-1/3 amp fused battery source should be provided for sensing lead of same polarity.

WARNING

The protection offered by fusing of transistorized equipment is limited; polarity must be observed or damage will result.

Electrical Connections

2.02 Installer connections, if necessary, are made at the printed circuit card socket or terminal block. Refer to the associated circuits for these connections.

Adjustment

2.03 Separate adjustments determine the low voltage and high voltage operating limits of the voltage relay. Follow the procedure outlined in paragraph 3.02 in making these adjustments.

3. ADJUSTMENT

General

3.01 Potentiometers R2 and R4 on the

Part Number	Input Voltage	Factory Setting	
		Release	Operate
4863-094	12V DC	11.8V	12.9V
4863-023	24V DC	23.4V	25.8V
4863-024	48V DC	47.5V	51.5V
4863-064	60V DC	58.5V	64.5V
4863-025	130V DC	126.0V	134.0V

TABLE 1

printed circuit card separately adjust the operating limits. In event the high or low voltage settings must be changed, the low voltage setting should be adjusted first as it sets the range of the high limit. A regulated variable DC test voltage source and an accurate DC voltmeter should be used to make these adjustments.

WARNING

Polarity of both DC supply voltage and test voltage connections to the voltage sensing circuit is critical; incorrect polarity will damage the voltage sensing assembly.

Procedure

3.02 Remove the supply fuse or disconnect the supply lead in order to remove regular DC input, and connect the variable test voltage source observing correct polarity to card socket pins C (negative) and S (positive).

3.03 Turn R2 fully counterclockwise and adjust the test voltage to the desired low limit. If relay K is not energized, turn R4 counterclockwise until relay K energizes. Slowly turn R4 clockwise until relay K releases. This sets the low limit.

3.04 Turn R2 fully clockwise. Set test voltage to desired high limit. Slowly turn R2 until relay K energizes. This sets the high limit.

4. CIRCUIT DESCRIPTION

General

4.01 Relay K, with a voltage detector circuit, make up the voltage control circuit. Relay K is normally energized and releases when the voltage being monitored decreases to a preset low limit. The relay will remain released until the monitored voltage increases to the preset high limit. Current to operate relay K is supplied by the voltage detector circuit.

Voltage Detector

4.02 A voltage sensing network compares the voltage being monitored with a constant voltage developed across a zener diode. The voltage sensing network is adjusted so that during a low voltage condition, the voltage developed is lower than the constant zener diode voltage. If the voltage being monitored should decrease to the low limit setting of potentiometer R4, the voltage detector circuit releases relay K. Once released, relay K will not energize until the voltage being monitored increases to the high limit setting of potentiometer R2.

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RELIANCE COMM/TEC

STOCK LIST

ITEM	NOTE	DESCRIPTION	PART NO	LIST 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	SHOP INST
1		RELAY RACK, 7'-0" X 24"	4124-010	1	1	1	1	1																X
		METER, CONT & DIST PNL	4374-149	1	1	1	1																	X
5		BAFFLE, 5-1/4" X 23"	3777-617						1															
		AMMETER, 0-50A	2925-320	1																				
		,0-100A	2925-324		1																			
10		,0-200A	2925-328			1																		
		,0-300A	2925-330				1																	
		SHUNT, 50A	2982-710	1																				
15		,100A	2982-712		1																			
		,200A	2982-714			1																		
		,300A	2982-656				1																	
20		RECTIFIER, RL50F50	5431-028							1														
		,RL100F50	5431-019								1													
		,RHM200050	5472-014									1												
		,RL50F50	5431-025										1											
C		,RL100F50	5432-009											1										
25		,RHM200C50	5475-010												1									
		INVERTER, WAA501B	5173-302													1								
		,WAA102B	5174-315														1							
30		,WAA202B	5175-306															1						
		FUSE, 30A	2483-515													1								
		,40A	2483-519	6	6	6																		
		,50A	2483-523														1							
		,60A	2483-525															1						
40																								
		FUSE REDUCER	2488-705													1								
E																								
45		LUG, 6-4/0	2456-338	2	2																			
		,1/0-500MCM	2456-346			2	2																	
		REAR COVER	4141-013	1	1	1	1																	
50																								
		NAMEPLATE	3184-701	1	1	1	1																	
F		BLANK PNL, 5-1/4" X 23"	3533-106												1									
60																								
G																								
65																								
70																								
H																								
75																								
80																								

MANUFACTURING NOTES

1. RECTIFIER DESIGNATIONS ARE TO BE 1/4" BLACK CHARACTERS. ALL OTHER STAMPING TO BE 3/16" UNLESS OTHERWISE SPECIFIED.
2. ASSEMBLE PER STANDARD EQUIPMENT ARRANGEMENTS UNLESS SPECIAL JOB PROFILE IS FURNISHED.

TABLE A

A EQUIPMENT (ENGINEERING INFORMATION)		B RATING	C LIST	D NO	E CIRCUIT & FIGURES EQUIPPED	SCHEMATIC INFORMATION NUMBER	FIG	OPT
COMMON EQUIPMENT, WIRING AND ASSEMBLY FOR ONE -48V POWER BOARD	50A		1	1	T-5821-052 FIG 4	SD-5821-052	3, 6-12	
	100A		2					
	200A		3					
	300A		4					
SUPPLEMENTAL RELAY RACK			5					
HEAT BAFFLE			6					
RECTIFIER, 60HZ	RL50F50		7	1	T-5821-052 FIG 1	SD-5821-052	1	
	RL100F50		8					
	RHM200050		9	1	T-5821-052 FIG 2	SD-5821-052	2	
RECTIFIER, 50-60HZ	RL50F50		10	1	T-5821-052 FIG 1	SD-5821-052	1	
	RL100F50		11					
	RHM200C50		12	1	T-5821-052 FIG 2	SD-5821-052	2	
INVERTER EQUIPPED WITH #1 TRANSFER CIRCUIT	WAA501B		13	1	T-5821-052 FIG 3	SD-5821-052	13	
	WAA102B		14					
	WAA202B		15					

TABLE B

ROLM SPECIFICATION NUMBER	CORRESPONDING LIST NUMBERS
VSCBXN500	L-1, 7 & 13
VXCBXR500	L-1,5, (2)7 & 13
VSCBXN1000	L-2,5,6 & 14
VSCBXR1000	L-2,5,6,(2)7 & 14
VSCBXN2000	L-2,5,8 & 15
VSCBXR2000	L-2,5,6,(2)8 & 15
IMCBXN500	L-2, 7 & 13
IMCBXR500	L-2,5, (2)7 & 13
IMCBXN1000	L-2,5,8 & 14
IMCBXR1000	L-2,5,6,(2)7 & 14
IMCBXN2000	L-2,5,8 & 15
IMCBXR2000	L-2,5,6,(2)8 & 15
2MCBXN500	L-2, 8 & 13
2MCBXR500	L-2,5, (2)8 & 13
2MCBXN1000	L-2,5,8 & 14
2MCBXR1000	L-2,5,6,(2)8 & 14
2MCBXN2000	L-3,5,9 & 15
2MCBXR2000	L-3,5,6,(2)8 & 15
3MCBXN500	L-3, 9 & 13
3MCBXR500	L-3,5, (2)9 & 13
3MCBXN1000	L-3,5,9 & 14
3MCBXR1000	L-3,5,6,(2)9 & 14
3MCBXN2000	L-3,5,9 & 15
3MCBXR2000	L-3,5,6,(2)9 & 15
4LCBXN500	L-3, 9 & 13
4LCBXR500	L-3,5, (2)9 & 13
4LCBXN1000	L-3,5,9 & 14
4LCBXR1000	L-3,5,6,(2)9 & 14
4LCBXN2000	L-3,5,9 & 15
4LCBXR2000	L-3,5,6,(2)9 & 15
5LCBXN500	L-3, 9 & 13
5LCBXR500	L-3,5, (2)9 & 13
5LCBXN1000	L-3,5,9 & 14
5LCBXR1000	L-3,5,6,(2)9 & 14
5LCBXN2000	L-4,5,9 & 15
5LCBXR2000	L-4,5,6,(2)9 & 15
6LCBXN500	L-4, 9 & 13
6LCBXR500	L-4,5, (2)9 & 13
6LCBXN1000	L-4,5,9 & 14
6LCBXR1000	L-4,5,6,(2)9 & 14
6LCBXN2000	L-4,5,9 & 15
6LCBXR2000	L-4,5,6,(2)9 & 15

ENGINEERING NOTES

51. EQUIPMENT TO BE ORDERED BY SPECIFICATION AND LIST NUMBER PER TABLE B.
52. INVERTERS ARE EQUIPPED WITH TRANSFER #1 ACCESSORY.

REVISIONS			
LTR		DWG	DESCRIPTION
1 pp	MAY 3 1977	M	

ITEM 37 PT NO. CORRECTED. TABLE B, CORRESPONDING LIST NO'S UPDATED. NOTE 52 ADDED.
2 183744 NOV 16 1982 M-12-82 D.A.C.
E Barnett 11-16-82

1846736

POWER SYSTEMS

EQUIPMENT AND ASSEMBLY
50-300 AMP, -48 VOLT
POWER BOARD

MODEL 200CBX

LORAIN PRODUCTS CORPORATION
LORAIN, OHIO

DESIGN	E GARTON	REV 2
DRAWN BY	E GARTON	DATE 4-15-82
CHECKED BY		DATE 4-27-82
APPROVED BY		DATE
APPROVED BY		DATE 4-27-82
RATING	STANDARD	

J-5821-052

DWG SIZE D

SHEET 1 OF 2

PRINTED IN U.S.A.

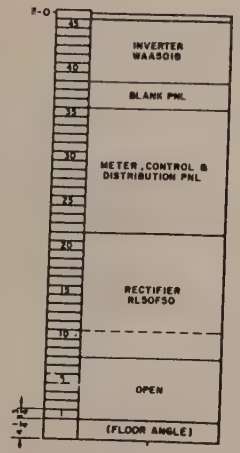


FIG 1
LIST 1 E/W 13 AND 7 OR 10

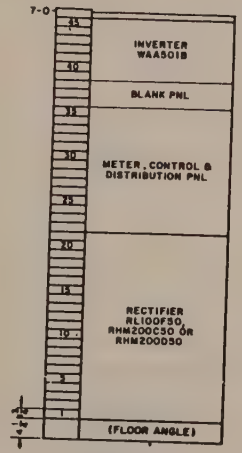


FIG 2
LIST 2, 3 OR 4 E/W 13 AND 8, 9, 11 OR 12

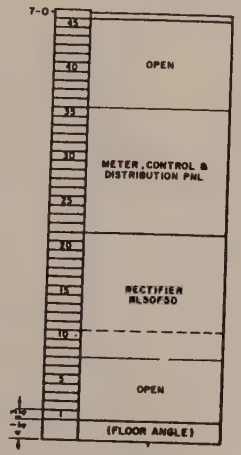


FIG 3
LIST 2 E/W 7 OR 10

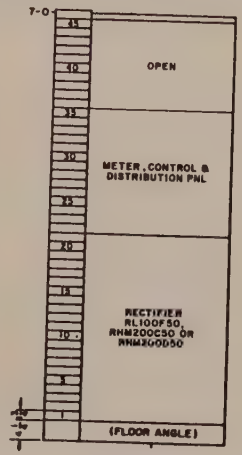


FIG 4
LIST 2, 3 OR 4 E/W 8, 9, 11 OR 12

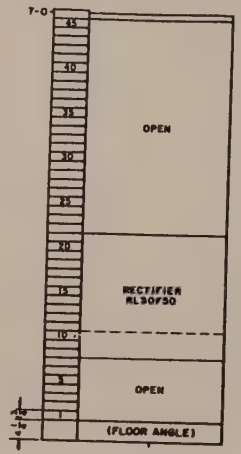


FIG 5
LIST 6 E/W 7 OR 10

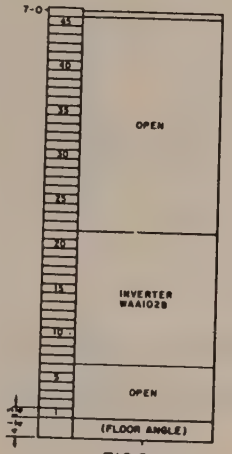


FIG 6
LIST 5 E/W 14

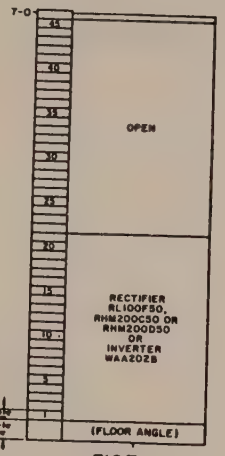


FIG 7
LIST 5 E/W 8, 9, 11, 12 OR 15

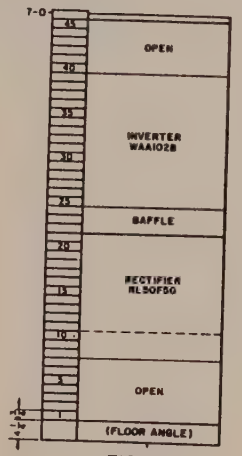


FIG 8
LIST 5 E/W 6, 14 AND 7 OR 10

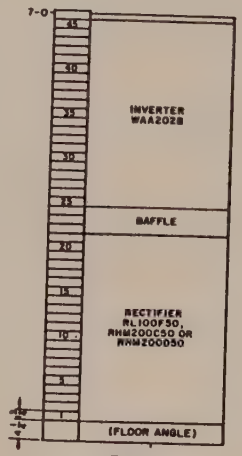


FIG 9
LIST 5 E/W 6, 15 AND 8, 9, 11 OR 12

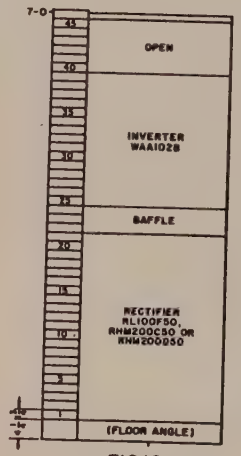


FIG 10
LIST 5 E/W 6, 14 AND 8, 9, 11 OR 12

MODEL 200CBX		J-5821-052
LORAIN PRODUCTS CORPORATION	SIZE D	SHEET 2 OF 2

SHEET INDEX

SHEET NO.	CONTENTS
1	SHEET INDEX CIRCUIT NOTES SUPPORTING INFORMATION OPTION INDEX INFORMATION NOTES
2	FIG 1 RL TYPE RECTIFIERS FIG 2 RHM TYPE RECTIFIERS FIG 3 CHARGE LEADS FIG 4 -48V BATTERY FIG 5 LOW VOLTAGE DISCONNECT FIG 6 DISTRIBUTION FUSES FIG 7 RECTIFIER REFERENCE FUSES FIG 8 AUTOMATIC EQUALIZE
3	FIG 9 CONTROL FUSES FIG 10 ALARM TERMINATION FIG 11 FUSE ALARM RELAY FIG 12 AUDIBLE VISUAL ALARM FIG 13 INVERTER

OPTION INDEX

APP OR WRG	LOCATION

SUPPORTING INFORMATION

CATEGORY	NO.
EQUIPMENT DRAWING	J-5821-052
WIRING DIAGRAM	T-5821-052 T-4394-149

CIRCUIT NOTES

101.

FEATURE OR OPTION		PROVIDE FIG	PROVIDE APP OR WRG	PROVIDE QUANTITY
-48V RECTIFIER	RL TYPE	1		AS REQD
	RHM TYPE	2		
-48V PLANT		3,5-12		ONE PER PLANT
INVERTER		13		AS REQD

102. REFER TO T-5821-052 FOR CABLING INFORMATION AND WIRE CALCULATION.

103. INVERTER FAIL ALARM IS INDICATED BY A CLOSED CIRCUIT BETWEEN TERMINAL 2 AND 3 AND AN OPEN CIRCUIT BETWEEN TERMINAL 1 AND 2 OF TB1.

104. RECTIFIER FAIL ALARM IS INDICATED BY A CLOSED CIRCUIT BETWEEN TERMINAL 4 AND 5 AND AN OPEN CIRCUIT BETWEEN TERMINAL 5 AND 6 OF TB1.

105. FUSE FAIL ALARM IS INDICATED BY A CLOSED CIRCUIT BETWEEN TERMINAL 7 AND 8 AND AN OPEN CIRCUIT BETWEEN TERMINAL 8 AND 9 OF TB1.

106. THIS LEAD IS CONNECTED TO TB1 TERMINAL 5 FOR USE WITH MODEL RHM200050 SPEC NUMBER 5472-014; OTHERWISE CONNECT TO TB1 TERMINAL 7.

INFORMATION NOTES

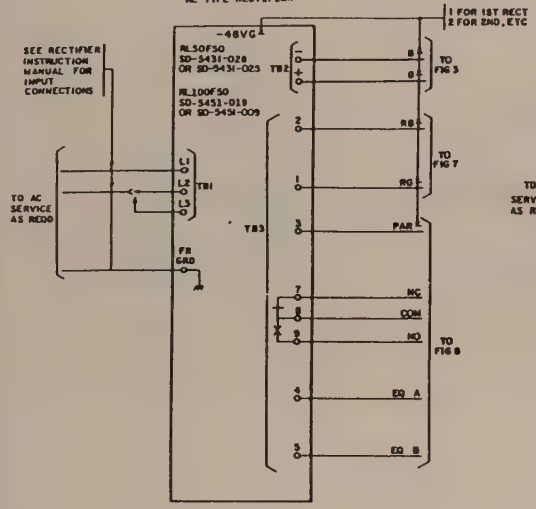
301. UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS. FUSE VALUES ARE IN AMPERES.

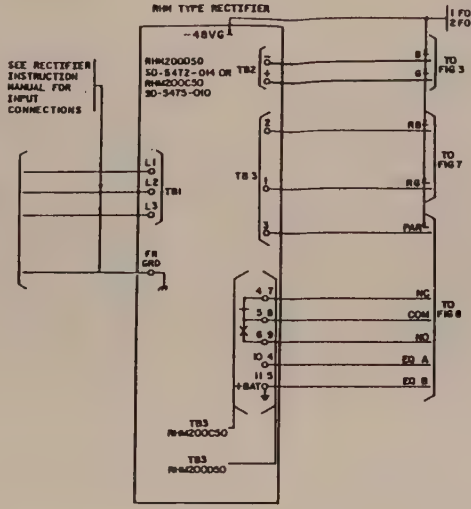
302. LEAD AND EQUIPMENT DESIGNATIONS FOLLOWED BY A DASH (-) INDICATE CIRCUIT AND EQUIPMENT NUMBERING: 1 FOR 1ST (FIGURE, CKT OR EQPT), 2 FOR 2ND ETC.

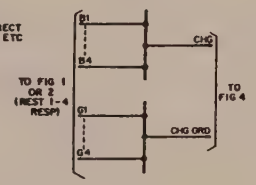
303. ALL RELAYS ARE SHOWN RELEASED.

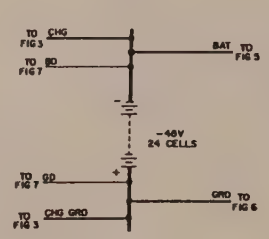
2	MAY 3 1982		M

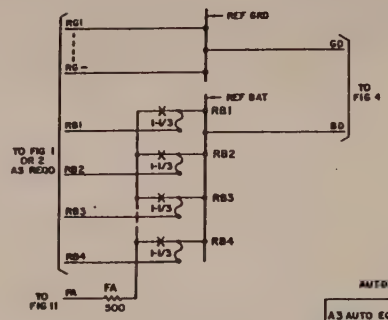
1846736		ISSUE 1
POWER SYSTEMS CHARGE-DISCHARGE CIRCUIT 50-230 AMP, -48 VOLT MODEL 200CBX	DRAWN BY R. HONEY DATE 4-2-82 CHECKED BY DATE 4-13-82 APPROVED BY DATE LOFTUS BY DATE 4-29-82 RATING STANDARD	SD-5821-052
LORAIN PRODUCTS CORPORATION LORAIN, OHIO LORAIN PRODUCTS (CANADA) LTD., ST THOMAS, ONTARIO	DWG SIZE D	3 SHEETS PRINTED IN U.S.A.
		SHEET 1

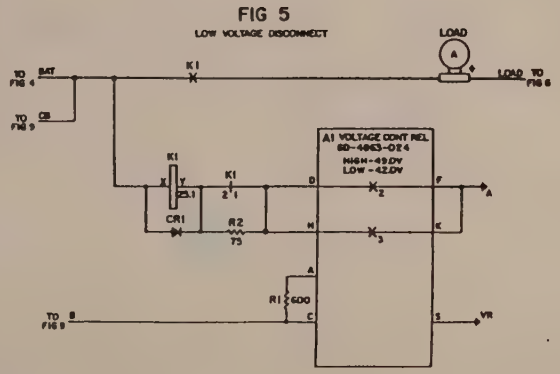


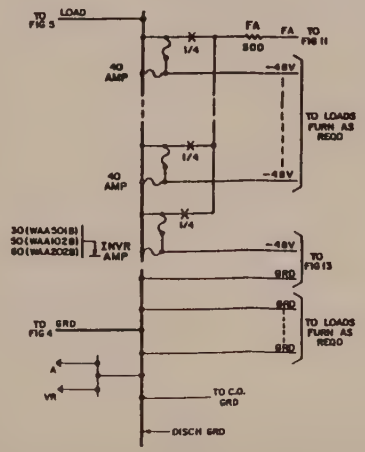


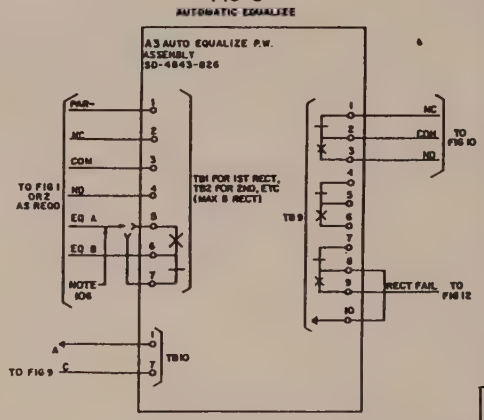












MODEL 200C2H	SD-5821-052
LORAIN PRODUCTS CORPORATION	DWG SIZE D
SHEET 2 OF 3	PRINTED IN U.S.A.

FIG 9
CONTROL FUSES

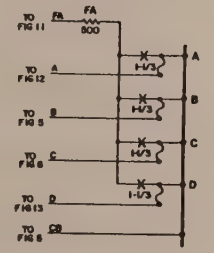


FIG 10
ALARM TERMINATION

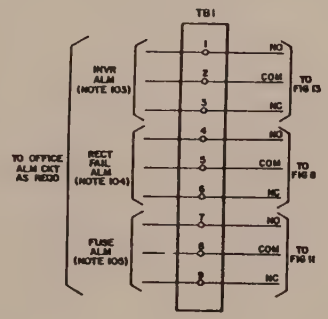


FIG 11
FUSE ALARM RELAY

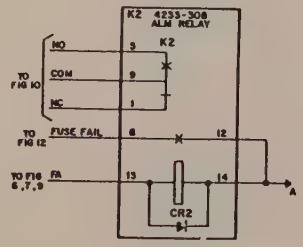


FIG 12
AUDIBLE VISUAL ALARM

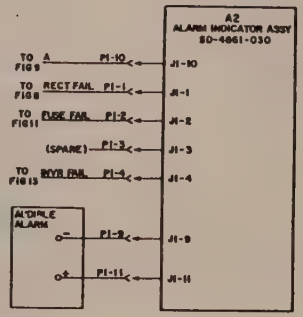
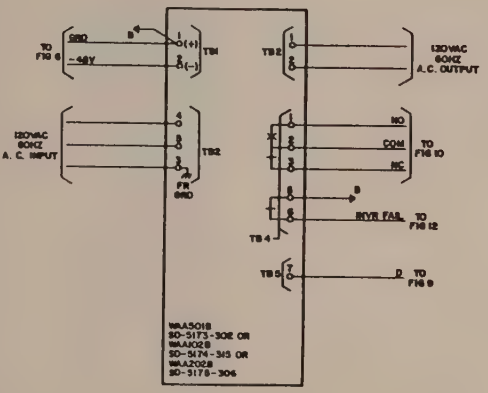


FIG 13
INVERTER



MODEL 2000BX		SD-5821-052
LORAIN PRODUCTS CORPORATION	SIZE D	SHEET 3 OF 3
		PRINTED IN U.S.A.

ISSUE 1

COMPONENT LIST

CAPACITOR

DESIG	CODE	
C1	(2737-133)	4.7UF, 35VDC, TANTALUM
(2) C2,8	(2737-134)	10UF, 20VDC, TANTALUM
(2) C3,4	(2724-139)	0.001UF, 1000VDC
C5	(2731-125)	47 UF, 50 VDC
C6	(2713-153)	0.1 UF
C7	(2713-118)	0.01UF

DIODE

DESIG	CODE	
(11) CR1,4,5,6,7,8,9, 10,11,12,13	(2182-223)	
(2) CR2,3	(2835-325)	6.2V, 0.4W ZENER

DIODE

DESIG	CODE	
(2) DS1, DS2	(2818-131)	LED, YELLOW
DS3	(2818-124)	LED, RED

E CELL

DESIG	CODE	
M1	(2877-102)	MICRO-COULOMETER

FUSE

DESIG	CODE	
F1	(2486-102)	1/4A GMT

INTEGRATED CIRCUITS

DESIG	CODE	
A1	(2871-112)	NORTON AMPLIFIER
A2	(2876-321)	QUAD 2 INPUT NAND GATE
A3	(2876-801)	QUAD BI-LATERAL SWITCH
A4	(2876-308)	QUAD 2 INPUT NOR GATE
(2) A5,6	(2876-501)	14 STAGE RIPPLE-CARRY BINARY COUNTER
A7	(2871-001)	TIMER

RESISTOR

DESIG	CODE	
R20	(2634-670)	274K, 1/4W
R36	(2634 690)	75K, 1/4W
R2	(2634-693)	82.5K, 1/4W ±1%
(2) R3,23	(2635-748)	392K, 1W ±1%
R4	(2634-714)	221K, 1/4W
R5	(2634-696)	100K, 1/4W
R6	(2634-688)	68.1K, 1/4W
R7	(2615-339)	1.5 MEGO, 1/2W
R8	(2634-681)	47.5K, 1/4W
(3) R9,15,17	(2615-327)	470K, 1/2W
(2) R10,11	(2615-335)	1MEGO, 1/2W
R12	(2615-323)	330K, 1/2W
(2) R13,38	(2635-801)	2MEGO, 1W ±1%
R14	(2634-601)	1.21K, 1/4W ±1%
(2) R16,40	(2635-721)	121K, 1W
R18	(2615-351)	4.7 MEGO, 1/2W
R19	(2651-544)	1K, 6.5W
R21	(2651-171)	390, 3W
(3) R22, 35,25	(2634-632)	4.75K, 1/4W
R24	(2675-126)	50K, 1/2W POT
R34	(2634-648)	10K, 1/4W
R26	(2651-330)	600, 3W
R27	(2651-337)	1.2K, 3W
R28	(2634-684)	56.2K, 1/4W
(2) R29, 32	(2634-623)	3.32K, 1/4W
R30	(2634-662)	18.2K, 1/4W
R31	(2634-609)	1.82K, 1/4W
R33	(2634-582)	475, 1/4W
(2) R37,43	(2634-665)	22.1K, 1/4W
R39	(2635-787)	1.21M, 1W
R41	(2635-761)	665K, 1W
R42	(2635-750)	422K, 1W

RELAY

DESIG	CODE	
(3) K1, 2, 3	(2543-428)	1200 OHM, 4C

SWITCH

DESIG	CODE	
S1	(2513-603)	DPDT
S2	(2513-566)	SW 8POLE

TRANSISTOR

DESIG	CODE	
Q1	(2841-036)	
Q2	(2841-100)	
(2) Q3,4	(2841-038)	

CIRCUIT DESCRIPTION

THIS CIRCUIT IS INTENDED AS AN AUTOMATIC EQUALIZE CONTROL FOR LORAIN RECTIFIERS.

WHEN THE BATTERY VOLTAGE IS BELOW FLOAT (ADJUSTABLE LIMIT SET BY R24), AND THE RECTIFIERS ARE NOT DELIVERING CURRENT. A SET CURRENT IS SENT THROUGH M1 BY ACTION OF THE TRANSMISSION GATES TO TURNING OFF Q1 AND TURNING ON Q2 AND Q3. WHEN THE RECTIFIERS RESUME CURRENT DELIVERING ABILITY THE CIRCUIT WILL SEND A CURRENT OF OPPOSITE POLARITY THROUGH M1 RESULTING IN Q3 REMAINING ON FOR A PERIOD OF TIME SELECTED BY SWITCH S2 TO GIVE 3, 6, OR 9 TIMES THE DURATION THAT THE BATTERY WAS BELOW FLOAT AND THE RECTIFIERS WERE OFF. Q3 TURNED ON, ILLUMINATES THE YELLOW LED (AUTO EQ) AND OPERATES RELAY K1 AND K2. RELAY K1 AND K2 PROVIDE TYPE C SETS OF CONTACTS TO OPERATE THE REMOTE EQUALIZE FEATURE OF UP TO EIGHT RECTIFIERS. AFTER THE EQUALIZE TIME HAS EXPIRED THE CIRCUIT WILL RETURN TO NORMAL CAUSING THE RECTIFIERS TO RETURN TO THE FLOAT MODE.

TO RETURN THE RECTIFIERS TO THE FLOAT MODE BEFORE THE EQUALIZE TIME HAS ELAPSED THE S1 SWITCH CAN BE MOMENTARILY PLACED IN THE "RESET" POSITION. IF THE CIRCUIT IS RESET, IT MUST STAY IN THE NORMAL MODE (NO EQUALIZE ALARM) FOR 2 MINUTES TO ALLOW INTERNAL CIRCUITRY TO RESET ITSELF BEFORE ANOTHER ALARM IS TURNED IN. AN INTERNAL TIMER, ALSO SET BY S2 WILL TERMINATE THE OFF TIMING CYCLE AFTER 100 HR FOR A X3 PERIOD, 50 HRS FOR A X6 PERIOD, AND 30 HRS FOR A X9 PERIOD, WHICH ALLOWS A MAX EQUALIZE TIME OF APPROX 300 HR FOR A X3 PERIOD, 300 HRS FOR A X6 PERIOD AND 270 HRS FOR A X9 PERIOD.

FOR MANUAL CONTROL OF THE EQUALIZE CHARGE MODE THE S1 SWITCH CAN BE PLACED IN THE "MAN" POSITION. THE YELLOW LED (MAN EQ) WILL ILLUMINATE AND RELAY K1 AND K2 WILL OPERATE. THE RELAY CONTACTS WILL OPERATE THE REMOTE EQUALIZE FEATURE OF THE RECTIFIERS UNTIL THE SWITCH IS RETURNED TO THE (AUTO EQ) POSITION.

FAILURE OF FUSE F1 OR PRESENCE OF BATTERY ON TERM. 2 OF TB1 THRU TB8 (WHEN CONNECTED TO THE RECTIFIERS) WILL ILLUMINATE RED LED (RECT FAIL/FA) AND OPERATE RELAY K3. CONTACTS OF RELAY K3 PROVIDE 3 SETS OF C TYPE CONTACTS ON THE TERM. STRIP TB9 FOR CONNECTION TO OFFICE ALARM CIRCUITS.

TERMINAL STRIP TB10 PROVIDES CONNECTIONS FOR NEG BATTERY INPUT (TERM. 7) AND POS GROUND INPUT (TERM. 1). NORMAL OPERATION IS FOR 48 VOLT. FOR 24 VOLT APPLICATIONS STRAPPING OPTIONS (A) MUST BE PROVIDED.

TIMING SET-UP

TIME MULTIPLIER	S2 POSITION (CL = CLOSED)							
	1	2	3	4	5	6	7	8
X3							CL	CL
X6				CL	CL			
X9	CL	CL						

MANUFACTURING REFERENCES

CATEGORY	NUMBER
ASSEMBLY DRAWING	4843-826
P.W. BOARD	3154-714
CONNECTOR ON FRAME	NONE

NOTES.

1. UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS AND CAPACITANCE VALUES ARE IN MICROFARADS. VALUES PRECEDED BY THE SYMBOL +(PLUS) OR -(MINUS) ARE IN VOLTS.
2. NORMAL OPERATION IS ON 48 VOLT BATTERY OPTION (A) IS FOR OPERATION ON 24 VOLT BATTERY
3. CODES WITHIN PARENTHESES AS (2737-132) REPRESENT LPC PART NUMBERS
4. FOR EXTENSION OF CIRCUIT BEYOND 8 RECTIFIERS SEE SD-4843-829 FOR ACCESSORY P.W. CARD CIRCUIT

REVISIONS			
2	M37468	3-9-81	R.H.
CIRCUIT REVISED FOR SELECTIVE TIMING			
3	M37639	10-1-81	R.L.
A2(2876-321), R20(2634-670), R25(2634-632) AND R36(2634-690) WERE 2876-301, 2634-696, 2634-648 AND 2634-681 RESP.			
4	M37675	11-9-81	T.I.
(1) BYPASS CAPACITOR C8 ADDED			

DESIGN		BA 4
DRAWN BY	E. GARTON	DATE 2-18-79
CHECKED BY		DATE 10-31-79
CHECKED BY		DATE
APPROVED BY	B.W. HOWALD	DATE 2-5-80
RATING		

AUTO-EQUALIZE CONTROL

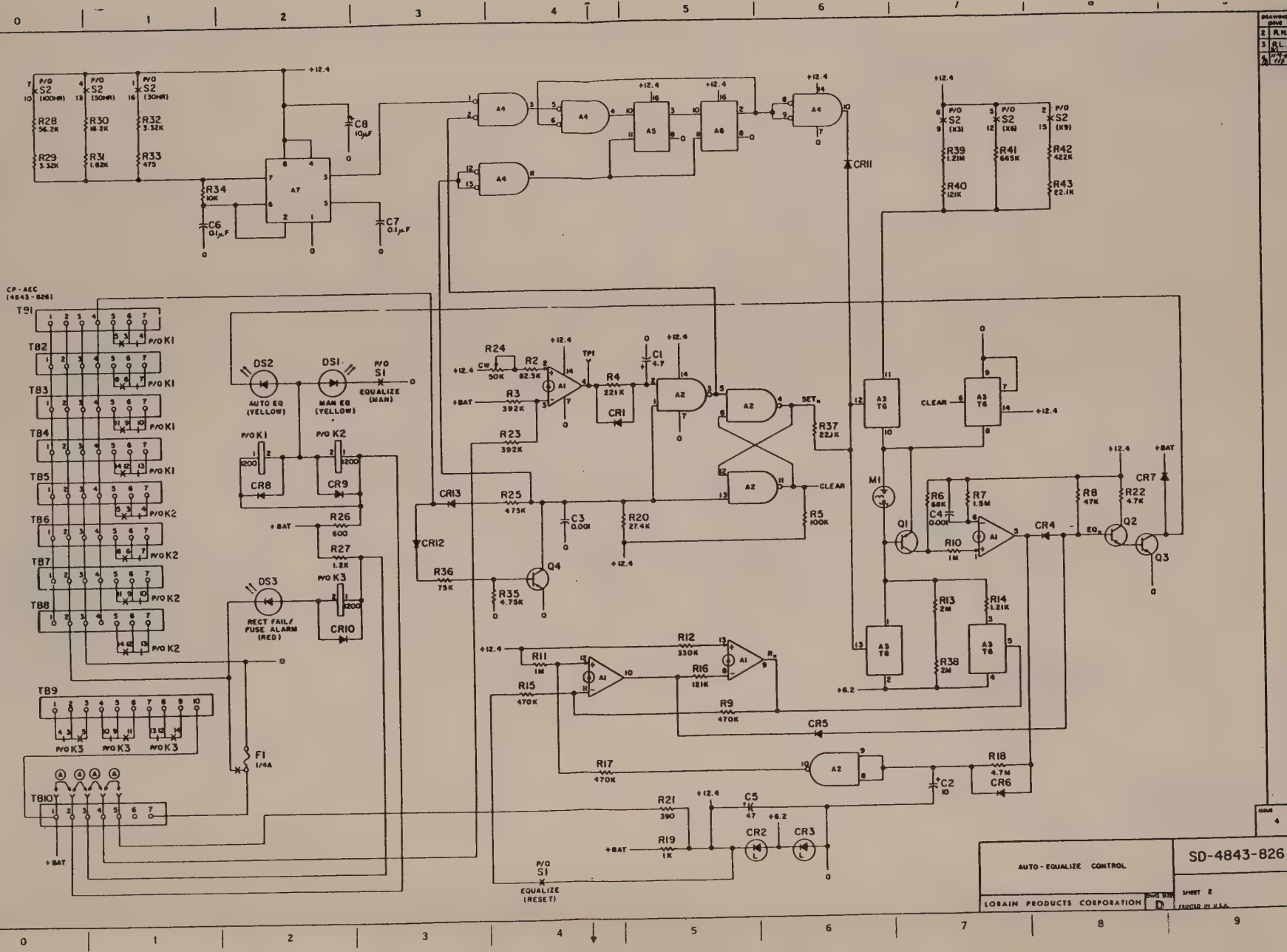
SD-4843-826

LORAIN PRODUCTS CORPORATION
LORAIN, OHIO

DWG SIZE D

SHEET 1 OF 2

PRINTED IN U.S.A.


AUTO - EQUALIZE CONTROL
SD-4843-826
LORAIN PRODUCTS CORPORATION
SHEET 2
DS1
DS2
DS3
AUTO EQ (YELLOW)
MAN EQ (YELLOW)
EQUALIZE (MAN)
RECT FAIL/ FUSE ALARM (RED)
EQUALIZE (RESET)
CLEAR
+12.4
+BAT
+6.2

MANUFACTURING REFERENCES	
CATEGORY	NUMBER
ASSEMBLY DRAWING	4861-030
P W BOARD	3155-637
CONNECTOR ON FRAME	2478-558

COMPONENT LIST

DIODES

	DESIG	CODE
(5)	CR1-5	(2811-101) 1N4148
(6)	CR6-11	(2812-310) 1N4818

DIODES, LIGHT EMITTING

	DESIG	CODE
(4)	DS-4	(2818-121) RED
	DS5	(2818-131) YELLOW

RELAY

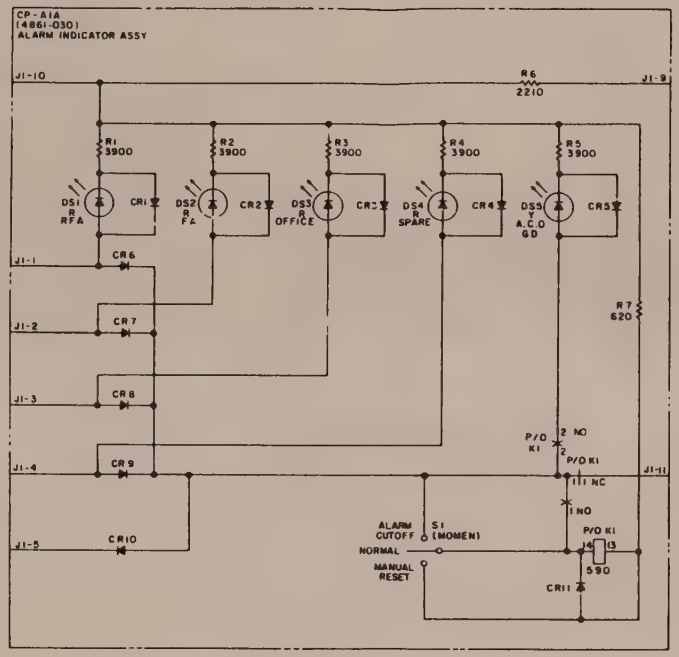
DESIG	CODE
K1	(2543-115) 24VDC, 590 OHMS

RESISTORS

	DESIG	CODE
(5)	R1-5	(2651-205) 3.9K, 3W
	R6	(2635-641) 2210 OHMS, 1W
	R7	(2651-180) 620 OHMS, 3W

SWITCH

DESIG	CODE
S1	(2513-603) 1PDT



SYMBOL
SHOWN IN DETAIL ON F S

CIRCUIT DESCRIPTION AND INPUT OUTPUT INFORMATION

A GROUND FED ALARM SIGNAL AT J1-1 THROUGH J1-4 WILL PRODUCE A GROUND AT J1-11 AND LIGHT AN ASSOCIATED LED. THE GROUND SIGNAL AT J1-11 MAY BE USED TO ACTUATE AN AUDIBLE ALARM.

IF IT IS DESIRED TO CUTOFF THE AUDIBLE ALARM, PLACING SWITCH S1 MOMENTARILY INTO THE ALARM CUTOFF POSITION WILL ENERGIZE RELAY K1 AND REMOVE GROUND FROM J1-11. AN ALARM CUTOFF GUARD LED WILL LIGHT. THE AUDIBLE ALARM MAY BE RECONNECTED BY PLACING S1 INTO THE MANUAL RESET POSITION WHEN THE ALARM GROUND IS REMOVED. THE K1 RELAY WILL BE DEENERGIZED REGARDLESS OF ITS PREVIOUS STATE AND THE CIRCUIT WILL BE READY FOR THE NEXT ALARM CONDITION.

DIODE CR10 IS PROVIDED TO EXTEND ANY OF THE GROUND ALARM SIGNALS AT J1-5.

NEGATIVE BATTERY FUSED AT 1/2 AMP IS REQUIRED AT J1-10. NEGATIVE SUPPLY VOLTAGE FOR AN AUDIBLE ALARM IS MADE AVAILABLE THROUGH R6 AT J1-9.

NOTES

1. UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS. VALUES PRECEDED BY THE SYMBOL + (PLUS) OR - (MINUS) ARE IN VOLTS.
2. CODES IN PARENTHESES, AS (2811-101) REPRESENT L P C PART NUMBERS.

1	NEW

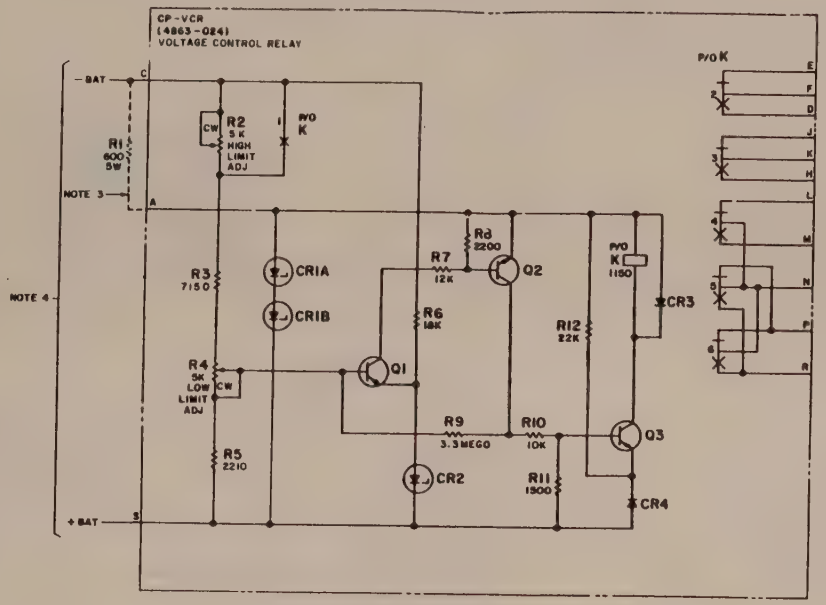
184-6390	DESIGN B BARNES	REV 1
	DRAWN BY J TUTTLE DATE 11-30-79	
SCHEMATIC DIAGRAM FOR ALARM INDICATOR ASSEMBLY	CHECKED BY DATE	
	APPV CHECKED BY DATE	
	APPROVED BY B Barnes DATE 2/29/80	
	EATON STANDARD	
	SD 4861-030	
LORAIN PRODUCTS CORPORATION LORAIN, OHIO	SIZE D	SHEET 1 OF 1

PRINTED IN U.S.A.

CPS-VCR
VOLTAGE CONTROL RELAY

COMPONENT LIST

DESIG	CODE
DIODE	
(2) CR1A,1B	(2836-212) 12V, 1W, ZENER
CR2	(2835-481) 8.2V, 0.4W, ZENER
(2) CR3, 4	(2812-310)
RELAY	
K	(2543-422)
RESISTOR	
(2) R2, 4	(2633-076) 5K POTENTIOMETER
R3	(2635-556) 7150 OHM, 1W, ±1%
R5	(2635-641) 2210 OHM, 1W, ±1%
R6	(2615-293) 18K, 1/2W
R7	(2615-289) 12K, 1/2W
R8	(2615-271) 2200 OHM, 1/2W
R9	(2615-347) 3.3 MEGO, 1/2W
R10	(2615-287) 10K, 1/2W
R11	(2615-267) 1500 OHM, 1/2W
R12	(2615-295) 22K, 1/2W
TRANSISTOR	
(2) Q1, 3	(2843-151)
Q2	(2841-155)



MANUFACTURING REFERENCES

CATEGORY	NUMBER
ASSEMBLY DRAWING	4863-024
P.W. BOARD	3187-113
CONNECTOR ON FRAME	3876-319 OR 4233-370

SYMBOL

SHOWN IN DETAIL IN FS

NOTES:

1. UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS AND CAPACITANCE VALUES ARE IN MICROFARADS
2. CODES WITHIN PARENTHESES AS (2836-212) REPRESENT LPC PART NUMBERS.
3. ITEMS SHOWN WITH DOTTED LINES ARE NOT SUPPLIED AS PART OF THIS ASSEMBLY.
4. PROVIDE 1/3 AMP FUSE IN EITHER -BAT. LEAD FOR POSITIVE GROUND SYSTEMS OR +BAT. LEAD FOR NEGATIVE GROUND SYSTEMS.
5. POLARIZING NOTCH ON B.

REVISION			
5	1833821 A1	REDRAWN	WAS SD-1866-02 ISS 4
6	183-6929	9-27-79	CR3 & CR4 WERE 2811-204, Q1 WAS 2847-098, Q2 WAS 2841-098, Q3 WAS 2847-100, R2 WAS 2633-072, &R3 WAS 2635-671.

VOLTAGE CONTROL RELAY
FOR 48 VOLT POWER BOARD
TWO LIMITS (OVERLAP)
CONTROL FUNCTION

DESIGN		REV 6
DRAWN BY DWG	DATE 5-25-65	
CHECKED BY D GURNACK	DATE 5-26-65	
APPROVED BY	DATE	
APPROVED BY G VASEK	DATE 5-28-65	
RATING STANDARD		

SD-4863-024

LORAIN PRODUCTS CORPORATION
LORAIN OHIO

DWG SIZE D

SHEET 1 OF 1

TABLE A

SD-T DWG CROSS REFERENCE & FIGURE LOCATION TABLE

ITEMS IN PARENTHESES ARE FOR INFORMATION ONLY AND ARE NOT TO BE RECORDED ON JOB WIRING LIST DRAWING

LINE	SD-5821-052 SHEET	SD-5821-052 FIG	SD-5821-052 OPT	T-5821-052 FIG	T-5821-052 WRG	T-5821-052 APP	T-5821-052 SHEET	REMARKS
1	2	1		1			2	
	2	2		2			2	
	3	13		3			2	
	2	4		4			2	
5	2,3	3,5-12		5			2	
10								
15								
20								
25								

TABLE B

RECORD OF FIGURES, APPARATUS AND WIRING CHANGES

CHANGED ON ISSUE	IF OFFICE RECORDS SPECIFY	IF OFFICE RECORDS DO NOT SPECIFY	THIS OPTION WAS FURNISHED	SEE ENG. NOTE	RATING STD	RATING A&M	RATING MD	RATING SPL

TABLE D

CALCULATION OF VARIABLE LEAD SIZES

LEAD	LOOP DROP (VOLTS)	CALCULATE FOR
Ⓑ	1.0	MAX CHARGE CAPACITY OF PLANT
Ⓒ	1.0	RATED CHARGE CAPACITY OF RECTIFIER (NOTE 56)
Ⓓ	0.5	MAX DISCHARGE CAPACITY OF PLANT

TABLE C

FEATURE TABLE

ITEM	FEATURE	SPECIFY T-5821-052 FIG	QUAN	WRG	APP	SEE NOTE	REMARKS
1	RL TYPE RECTIFIER	1	AS REQD			56	
2	RHM TYPE RECTIFIER	2	AS REQD			56	
3	INVERTER	3	1				
4	-48V BATTERY	4					NOT PROVIDED FURN ON JOB BASIS
5	METER, CONTROL AND DISTRIBUTION	5	1				

BATTERY LEADS

CHARGE OR DISCHARGE CAPACITY OF PLANT, AMPERES	LEAD SIZE Ⓑ, Ⓓ	MAX LOOP LENGTH BAT TO PWR BD Ⓑ	MAX LOOP LENGTH BAT TO PWR BD Ⓓ
50	6	48'	24'
	4	75'	38'
	2		60'
	1/0		95'
75	4		25'
	2		40'
	1/0		64'
	2/0		80'
	3/0		100'
100	2	60'	30'
	1/0	95'	48'
	2/0		60'
	3/0		75'
	4/0		95'
150	1/0	64'	32'
	2/0	80'	40'
	3/0		50'
	4/0		64'
	250MCM		75'
	300MCM		90'
200	3/0	76'	38'
	4/0	96'	48'
	250MCM		56'
	300MCM		68'
	350MCM		78'
	400MCM		90'
230	4/0		41'
	250MCM		48'
	300MCM		59'
	350MCM		68'
	400MCM		78'
	500MCM		98'
300	350MCM	105'	
400	(2) 3/0	76'	
	(2) 4/0	95'	
	(2) 250MCM	112'	

ENGINEERING NOTES

51. THIS DRAWING AGREES WITH ISSUE 1 2; SD-5821-052 ISSUE 1 1

52. EQUIPMENT ARRANGEMENT PER J-5821-052

53. A C SERVICE EQUIPMENT NOT PROVIDED; FURN AS REQD

54. DISTRIBUTION FUSES SHOWN ARE TYPICAL, QUANTITY AND CAPACITY SHALL BE FURN IN ACCORDANCE WITH JOB INFO

55. INSTRUCT INSTALLER TO CONNECT ALARM STRAPPING AS REQD PER JOB CONDITION

56. SEE ASSOCIATED POWER DATA SHEET OR 48 VOLT RECTIFIER DWG 0311-916 FOR REQD TERMINATIONS, WIRE AND FUSE SIZES FOR RECTIFIER MODEL BEING USED

MANUFACTURING NOTES

SHOP	INST.		NOTE
X		1	COLORED LEADS NOT OTHERWISE SPECIFIED TO BE 20 GA
X		2	BI-TERMINAL NEAREST PANEL
X	X	3	Ø - LEADS RUN BY INSTALLER
X		4.	∞ - LEADS INSULATED WITH SLEEVING
X	X	5	DO NOT CUT CALIBRATED SHUNT LEADS FOLD UP EXCESS AND TIE TO WIRE HARNESS
X	X	6.	LEADS SHOWN TERMINATED IN COMPONENTS WITHOUT TERMINALS ARE FURNISHED WITH COMPONENTS
X		7	D-WIRING NOT INCLUDED IN LOCAL WIRE HARNESS BUT RUN AS SEPARATE LEADS
X	X	8	Δ - LEADS RUN BY SHOP WHEN ASSOCIATED EQUIPMENT IS SHOP MOUNTED IN SAME BAY, OTHERWISE RUN BY INSTALLER
X	X	9	SEE J-5821-052 AND ASSOCIATED ASSEMBLY DRAWINGS FOR PART NUMBERS.
X	X	10	TERMINAL ON CARD RECEPTACLE SHOWN SOLID DENOTES LOCATION OF POLARIZING KEY
X	X	11	CONNECT THIS LEAD TO TB1 TERMINAL 5 FOR USE WITH MODEL RHM200050 SPEC NUMBER 5472-014; OTHERWISE CONNECT TO TB1 TERMINAL 7.
X	X	12.	INVERTER FAIL ALARM IS INDICATED BY A CLOSED CIRCUIT BETWEEN TERMINAL 2 AND 3 AND AN OPEN CIRCUIT BETWEEN TERMINAL 1 AND 2 OF TB1
X	X	13	RECTIFIER FAIL ALARM IS INDICATED BY A CLOSED CIRCUIT BETWEEN TERMINAL 4 AND 5 AND AN OPEN CIRCUIT BETWEEN TERMINAL 5 AND 6 OF TB1.
X	X	14	FUSE FAIL ALARM IS INDICATED BY A CLOSED CIRCUIT BETWEEN TERMINAL 7 AND 8 AND AND OPEN CIRCUIT BETWEEN TERMINAL 8 AND 9 OF TB1.
X		15	Ⓒ LEADS TO BE 8GA FOR WAA501B AND 6GA FOR WAA102B AND WAA202B.

	BY	DATE		
1		MAY 3 1982		M

AUTO EQUALIZE WIRING CORRECTED NOTE 56 ADDED BF NOV 1982

2 1837844 11-12-82 M 11-12-82 D A.C.

1846736

ISSUE 2

POWER SYSTEMS

CHARGE AND DISCHARGE CIRCUIT 50-300 AMP, -48 VOLT

MODEL 200CBX

DRAWN BY	R. MONEY	DATE 4-14-82
CHECKED BY		DATE 4-27-82
APPROVED BY		DATE
APPROVED BY		DATE 4-29-82

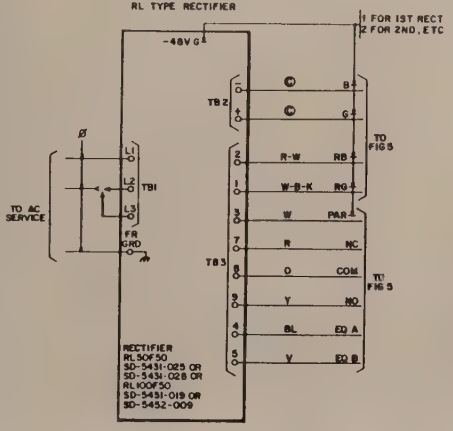
RATING: STANDARD

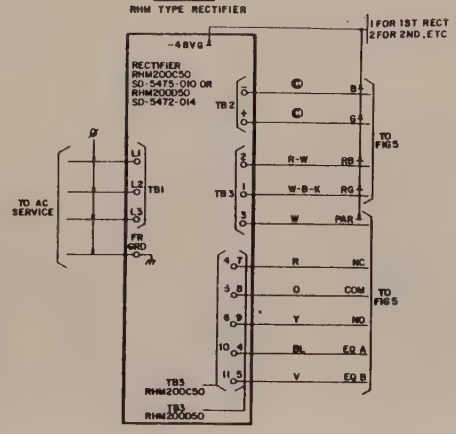
T-5821-052

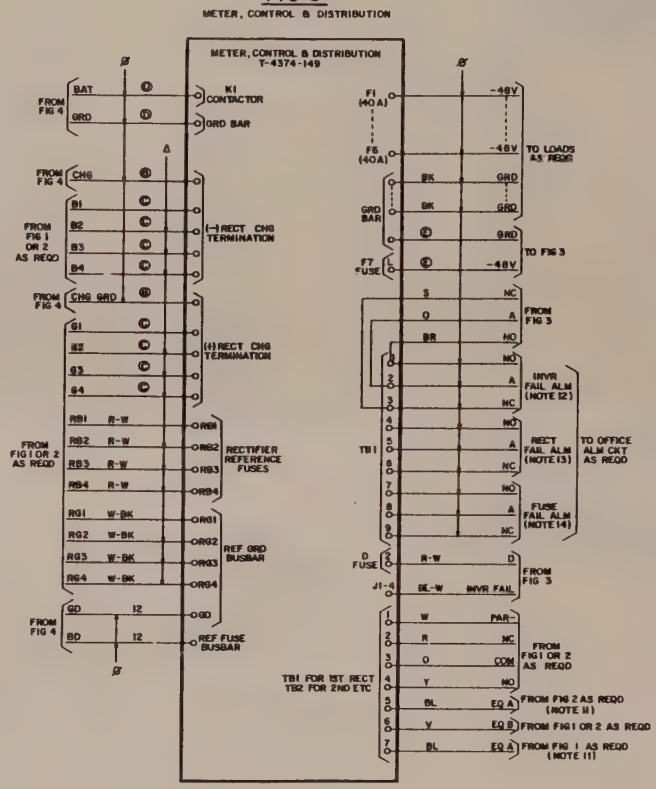
LORAIN PRODUCTS CORPORATION
LORAIN, OHIO
LORAIN PRODUCTS (CANADA) LTD ST THOMAS, ONTARIO

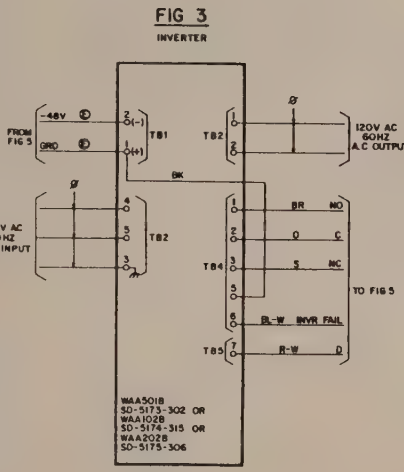
DWG SIZE D | 2 SHEETS | SHEET 1

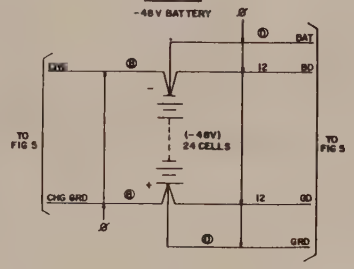
PRINTED IN U.S.A.











MODEL 200CBX	T-5821-052	
LORAIN PRODUCTS CORPORATION	DWG SIZE D	SHEET 2 OF 2
	PRINTED IN U.S.A.	ISSUE 2

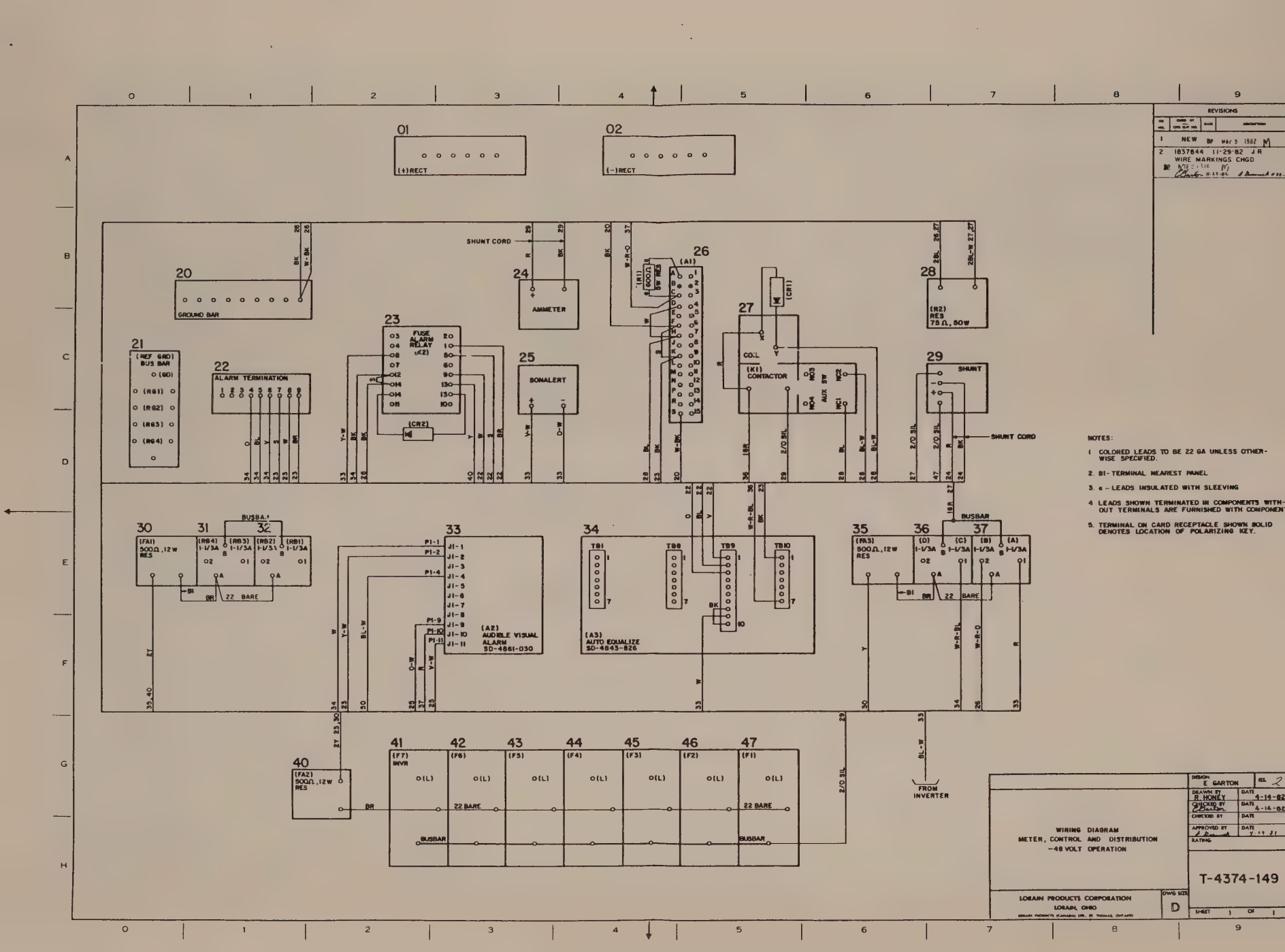

REVISIONS
1 NEW BP MAY 3 1982 M
2 1837844 11-29-82 J.R. WIRE MARKINGS CHGD
01
(+)RECT
02
(-)RECT
20
GROUND BAR
21
(REF GRD) BUS BAR
(G0)
(RG1)
(RG2)
(RG3)
(RG4)
22
ALARM TERMINATION
23
FUSE ALARM RELAY (K2)
(CR2)
24
AMMETER
SHUNT CORD
25
SONALERT
26
(A1)
(R1) 500Ω 5W RES
27
(CR1)
COIL
(K1) CONTACTOR
NO3 AUX SW NC2 NO4 NC1
28
(R2) RES 75Ω, 80W
29
SHUNT
SHUNT CORD
30
(FA1) 500Ω, 12W RES
31
(RG4) 1-1/3A
(RG3) 1-1/3A
32
(RG2) 1-1/3A
(RG1) 1-1/3A
BUSBAR
22 BARE
33
J1-1 J1-2 J1-3 J1-4 J1-5 J1-6 J1-7 J1-8 J1-9 J1-10 J1-11
P1-1 P1-2 P1-4 P1-9 P1-10 P1-11
(A2) AUDIBLE VISUAL ALARM SD-4861-030
34
TB1 TB8 TB9 TB10
(A3) AUTO EQUALIZE SD-4843-826
35
(FA3) 500Ω, 12W RES
36
(D) 1-1/3A
(C) 1-1/3A
37
(B) 1-1/3A
(A) 1-1/3A
BUSBAR
22 BARE
40
(FA2) 500Ω, 12W RES
41
(F7) INVR
42
(F6)
43
(F5)
44
(F4)
45
(F3)
46
(F2)
47
(F1)
O(L)
22 BARE
BUSBAR
FROM INVERTER
NOTES:
1 COLORED LEADS TO BE 22 GA UNLESS OTHERWISE SPECIFIED.
2. B1- TERMINAL NEAREST PANEL
3. a – LEADS INSULATED WITH SLEEVING
4 LEADS SHOWN TERMINATED IN COMPONENTS WITHOUT TERMINALS ARE FURNISHED WITH COMPONENT
5. TERMINAL ON CARD RECEPTACLE SHOWN SOLID DENOTES LOCATION OF POLARIZING KEY.
WIRING DIAGRAM
METER, CONTROL AND DISTRIBUTION
-48 VOLT OPERATION
LORAIN PRODUCTS CORPORATION
LORAIN, OHIO
DESIGN E GARTON
DRAWN BY R HONEY DATE 4-14-82
CHECKED BY DATE 4-14-82
APPROVED BY DATE 4-19-82
RATING
T-4374-149
DWG SIZE D
SHEET 1 OF 1

TABLE A

RECTIFIER SPECIFICATIONS

SEE FIG	SEE NOTE	MODEL SPEC	A.C. INPUT VOLTS	A.C. INPUT RECM FUSING AMPS	A.C. INPUT RECM WIRE SIZE	FRAME GRD RECM WIRE SIZE	D.C. OUTPUT VOLTS	D.C. OUTPUT AMPS	©	RECM OUTPUT LEAD SIZE FOR 10 VOLT LOOP DROP						
									14	12	10	8	6	4	2	1/0	2/0
1U	7	RJ6A50 5351-008	120	15	14	14	50	6	60'	97'	155'						
1A		L6A50 5351-006	120	15	14	14	50	6	60'	97'	155'						
1A		M6F50 5351-003	120	15	14	14	50	6	60'	97'	155'						
			240	(2) 15													
1V	5,6	RJ6F50 5351-009	120	15	14	14	50	6	60'	97	155'						
			240	(2) 15													
1A		L12A50 5371-013	120	15	14	14	50	12		49'	78'	124'					
1A		M12F50 5371-006	120	15	14	14	50	12		49'	78'	124'					
			240	(2) 15													
1U	7	RJ12A50 5371-016	120	15	14	14	50	12	30'	49'	78'	124'					
1V	5,6	RJ12F50 5371-017	120	15	14	14	50	12	30'	49'	78'	124'					
			240	(2) 15													
1A		M18F50 5371-006	120	30	10	10	50	18			52'	83'	132'				
			240	(2) 15	14	14											
1Z	6	RJ20F50 5371-020	120	20	12	12	50	20		29'	47'	75'	118'				
			240	(2) 15	14	14											
1B		M25F50 5411-033	120	30	10	10	50	25				60'	95'	150'			
			240	(2) 15	14	14											
1C		M25F50 5411-039	120	25	10	10	50	25				60'	95'	150'			
			240	(2) 15	14	14											
1W	4	RL30F5 5411-044	120	25	10	10	50	30				50'	79'	125'			
			240	(2) 15	14	14											
1T	5	RL30F50 5411 045	120	25	10	10	50	30				50'	79'	125'			
			240	(2)15	14	14											
1B		L30F50 5411-037	120	30	10	10	50	30				50'	79'	125'			
			240	(2) 15	14	14											
1B		M30F50 5411-025	120	40	8	10	50	30				50'	79'	125'			
			240	(2)20	12	12											
1R	4	RL30F50 5411-043	120	25	12	10	50	30				50'	79'	125'			
			240	(2)15	14	14											
1B		M37F50 5411-026	120	50	6	10	50	37					64'	102'	160'		
			240	(2) 25	10												
1T	5	RL50F50 5431-025	120	40	8	10	50	50					47'	75'	120'		
			240	(2)25	10												
1C		HM50F50 5431-019	120	50	6	10	50	50					47'	75'	120'		
			240	(2) 25	10												
1E		HM50D50 5434-006	240	(3) 15	14	14	50	50					47'	75'	120'		
1B		L50F50 5431-018	120	50	6	10	50	50					47'	75'	120'		
			240	(2) 25	10												
1B		M50F50 5431-006	120	60	6	10	50	50					47'	75'	120'		
			240	(2) 30	10												
1D		M50D50 5434-001	240	(3) 15	14	14	50	50					47'	75'	120'		
1R	4	RL50F50 5431-023	120	35	10	10	50	50					47'	75'	120'		
			240	(2)20	12	12											
1W	4	RL50F50 5431-024	120	40	8	10	50	50					47'	75'	120'		
			208	(2) 25	10												
			240	(2)20	12	12											
1F		M75D50 5444-003	240	(3) 25	10	10	50	75							80'	127'	
1B		M75F50 5441-001	120	100	2	8	50	75							80'	127'	
			240	(2) 50	6	10											
1C		HM100F50 5451-017	120	100	2	8	50	100							60'	95'	120'
			240	(2) 50	6	10											
1E		HM100D50 5454-006	240	(3) 30	10	10	50	100							60'	95'	120'
1B		L100F50 5452-004	120	100	2	8	50	100							60'	95'	120'
			240	(2) 50	6	10											
1B		M100F50 5451-001	120	100	2	8	50	100							60'	95'	120'
			240	(2) 50	6	10											
1F		M100D50 5454-003	240	(3) 35	8	10	50	100							60'	95'	120'
1Q		F100D50	240	(3) 30	10	10	50	100							60'	95'	120'
1S		XS2049L2F 5451-010	240	50 DUAL ELEMENT	6	10	50	100							60	95'	120'
1R	4	RL100F50 5451-018	120	70	6	8	50	100							60'	95'	120'
			240	(2) 40	8	10											
1J	5	RHM100D50 5454-009	240	(3) 30	10	10	50	100							60'	95'	120'
1J		RHM100D50 5454-008	240	(3) 30	10	10	50	100							60'	95'	120'
1T	5	RL100F50 5452 009	120	80	4	8	50	100							60'	95'	120'
			127	70													
			208	(2) 50	6												
			220-240	(2) 40	8												
1J	5	RHM100C50 5457-005	380 400 415	(3) 15	14	14	50	100							60'	95'	120'
1W	4	RL100F50 5451-019	120	80	4	8	50	100							60'	95'	120'
			208	(2) 50	6												
			240	(2) 40	8	10											
1Y		RHM100D50 5454-010	240	(3) 30	8	10	50	100							60'	95'	120'

TABLE A

RECTIFIER SPECIFICATIONS

SEE FIG	SEE NOTE	MODEL SPEC	A.C. INPUT VOLTS	A.C. INPUT RECM FUSING AMPS	A.C. INPUT RECM WIRE SIZE	FRAME GRD RECM WIRE SIZE	D.C. OUTPUT VOLTS	D.C. OUTPUT AMPS	©	RECM OUTPUT LEAD SIZE FOR 10 VOLT LOOP DROP					
									4/0	250 MCM	(2)250 MCM	600 MCM	(2)600 MCM		(4)600 MCM
1Y		RHM200D50 5472-014	240	(3) 60	6	10	50	200	95'	112'					
1E		HM200D50 5472-009	240	(3) 50	8	10	50	200	95'	112'					
1E		HM200E50 5475-008	480	(3) 30	10	10	50	200	95'	112'					
1J		RHM200D50 5472-012	240	(3) 60	6	10	50	200	95'	112'					
1F		M200D50 5472-003	240	(3) 60	6	10	50	200	95'	112'					
1J	5	RHM200D60 5472-013	240	(3) 60	6	10	50	200	95'	112'					
1Q		F200D50 5471-001	240	(3) 60	6	10	50	200	95'	112'					
1J	5	RHM200C50 5475-010	380 400 415	(3) 30	10	10	50	200	95'	112					
1J		RHM400D50 5481-029	240	(3)125	2	6	50	400				135'			
1J	5	RHM400D50 5481-034	240	(3)125	2	6	50	400				135'			
1H		HM400D50 5481-018	240	(3)100	2	8	50	400				135'			
1N		HM400E50 5482-007	480	(3) 50	6	10	50	400				135'			
1J	5	RHM400C50 5482-017	380 400 415	(3)60	6	10	50	400				135'			
1K		M400D50 5481-009	240	(3)100	2	8	50	400			112'				
1Y		RHM400D50 5481-036	240	(3)100	2	8	50	400				135'			
1Q		F400D50 5481-004	240	(3)100	2	8	50	400			112'				
1X		RL400D50 5481-035	240	(3)100	2	8	50	400			112'	135'			
1H		HM800D50 5484-019	240	(3)200	4/0	6	50	800					134'		
1H		HM800E50 5485-013	480	(3)100	2	8	50	800					134'		
1J		RHM800D50 5484-030	240	(3)225	4/0	3	50	800					134'		
1L		M800D50 5484-008	240	(3)200	4/0	6	50	800					134'		
1P		M800E50 5485-006	480	(3)100	2	8	50	800					134'		
1M		HM1600D50 5487-006	240	(3)400	500 MCM	3	50	1600							134'
1N		HM1600E50 5487-207	480	(3)200	4/0	6	50	1600							134'

NOTES

1. RECTIFIER TERMINATIONS SHOWN ARE FOR USE WITH STANDARD POWER BOARD FEATURES. FOR OTHER AVAILABLE FUNCTIONS NOT SHOWN SEE RECTIFIER POWER DATA SHEET AND PROVIDE AS REQUIRED
2. ALL COLORED LEADS TO BE 18GA UNLESS OTHERWISE SPECIFIED
3. WIRE SIZES MEET THOSE RECOMMENDED IN NATIONAL ELECTRIC CODE TABLE FOR NOT MORE THAN THREE COPPER CONDUCTORS IN RACEWAY FOR 75°C CONDUCTOR TEMP
4. FOR THESE MODELS, 120 VOLT A.C. SERVICE IS CONNECTED TO TB1, TERMS L1 & L3; OR 208/240 VOLT TO L1 & L2
5. 50/60 HZ MODEL
6. FOR THESE MODELS, 120 VOLT A.C. SERVICE IS CONNECTED TO TB3, TERMS 1 & 3; OR 208/240 VOLT TO 1 & 2.
7. MODEL EQUIPPED WITH A.C. INPUT CORD.

REVISIONS

NO	CODE IDENT NO	DWG NO	REV	DESCRIPTION
1				
2	1836628		8-3-78	D.A.C. (NEW MODELS, NOTE 5 ADDED)
3	1836929		9-21-79	J.R. (NEW MODELS, NOTES 6 & 7 ADDED)

DP SEP 27 1979

POWER SYSTEMS

48 VOLT RECTIFIER
CONNECTIONS & SPECIFICATIONS
FOR USE WITH STANDARD
POWER BOARD MODELS

LORAIN PRODUCTS CORPORATION
LORAIN, OHIO

DESIGN	AA 3
DRAWN BY	DATE F-14-78
CHECKED BY	DATE 8 17 78
APPROVED BY	DATE F 30-78
RATING	STANDARD

0311-916

DWG SIZE D

SHEET 1 OF 5

FIG 1A
RECTIFIER

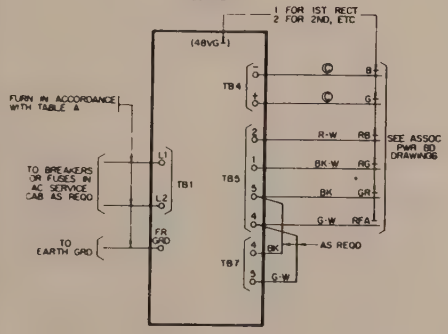


FIG 1B
RECTIFIER

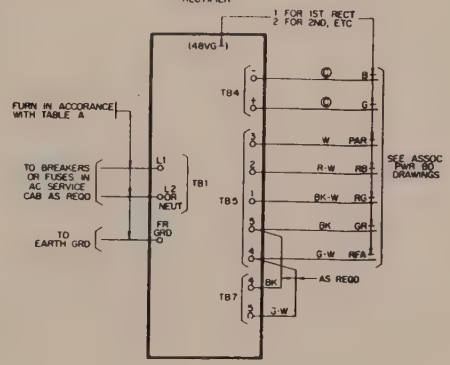


FIG 1C
RECTIFIER

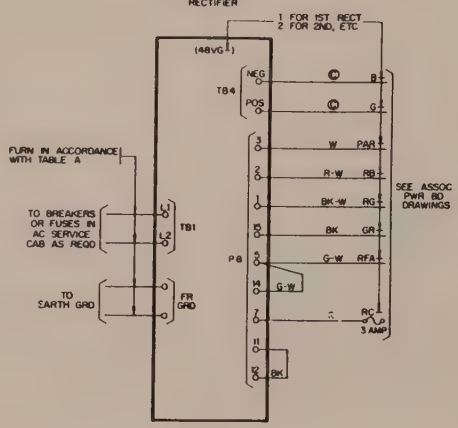


FIG 1D
RECTIFIER

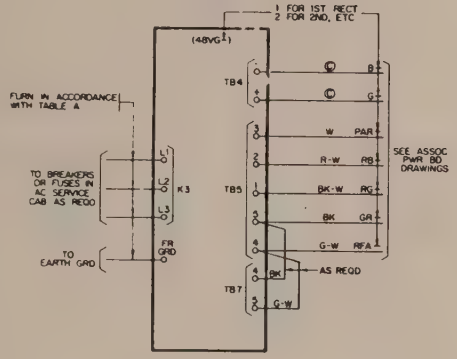


FIG 1E
RECTIFIER

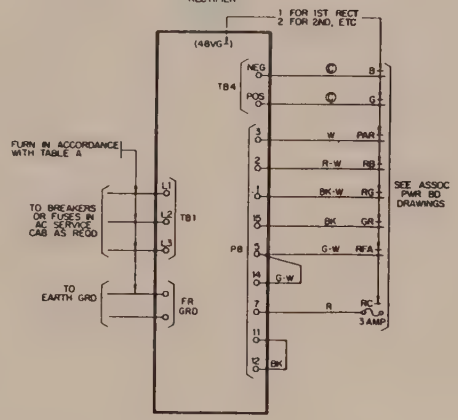
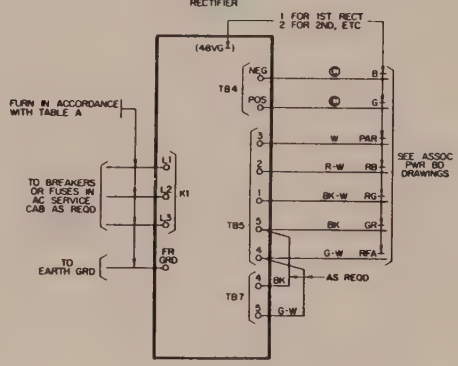


FIG 1F
RECTIFIER



ISSUE 3

48 VOLT RECTIFIER WIRING	0311-916
LORAIN PRODUCTS CORPORATION — DWG SIZE D	SHEET 2
PRINTED IN U.S.A.	

FIG 1H
RECTIFIER

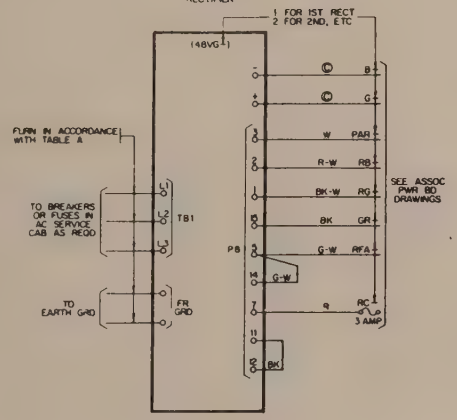


FIG 1J
RECTIFIER

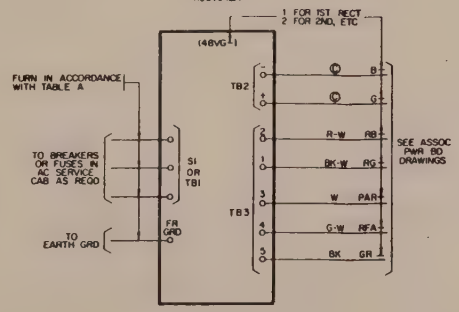


FIG 1K
RECTIFIER

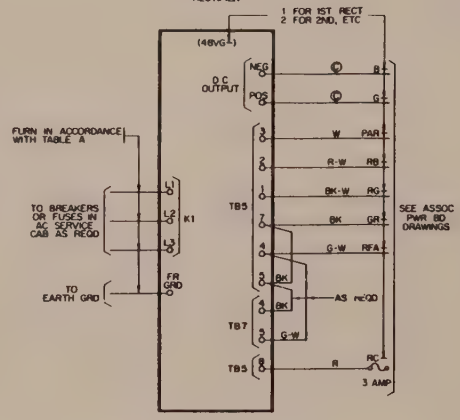


FIG 1L
RECTIFIER

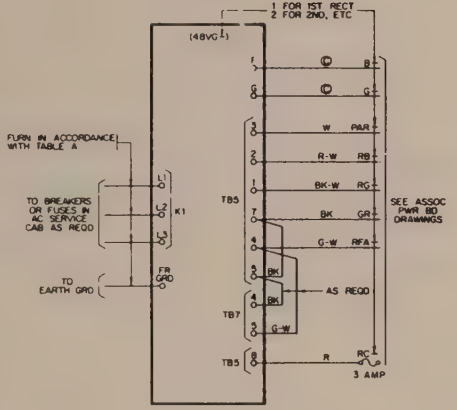


FIG 1M
RECTIFIER

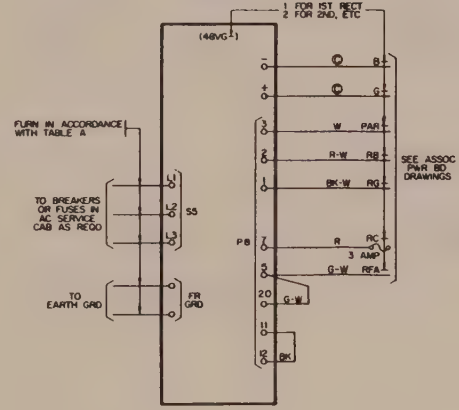
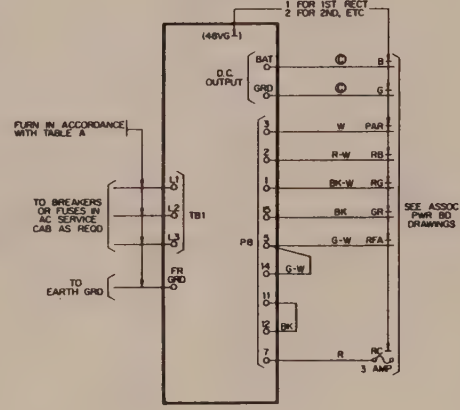
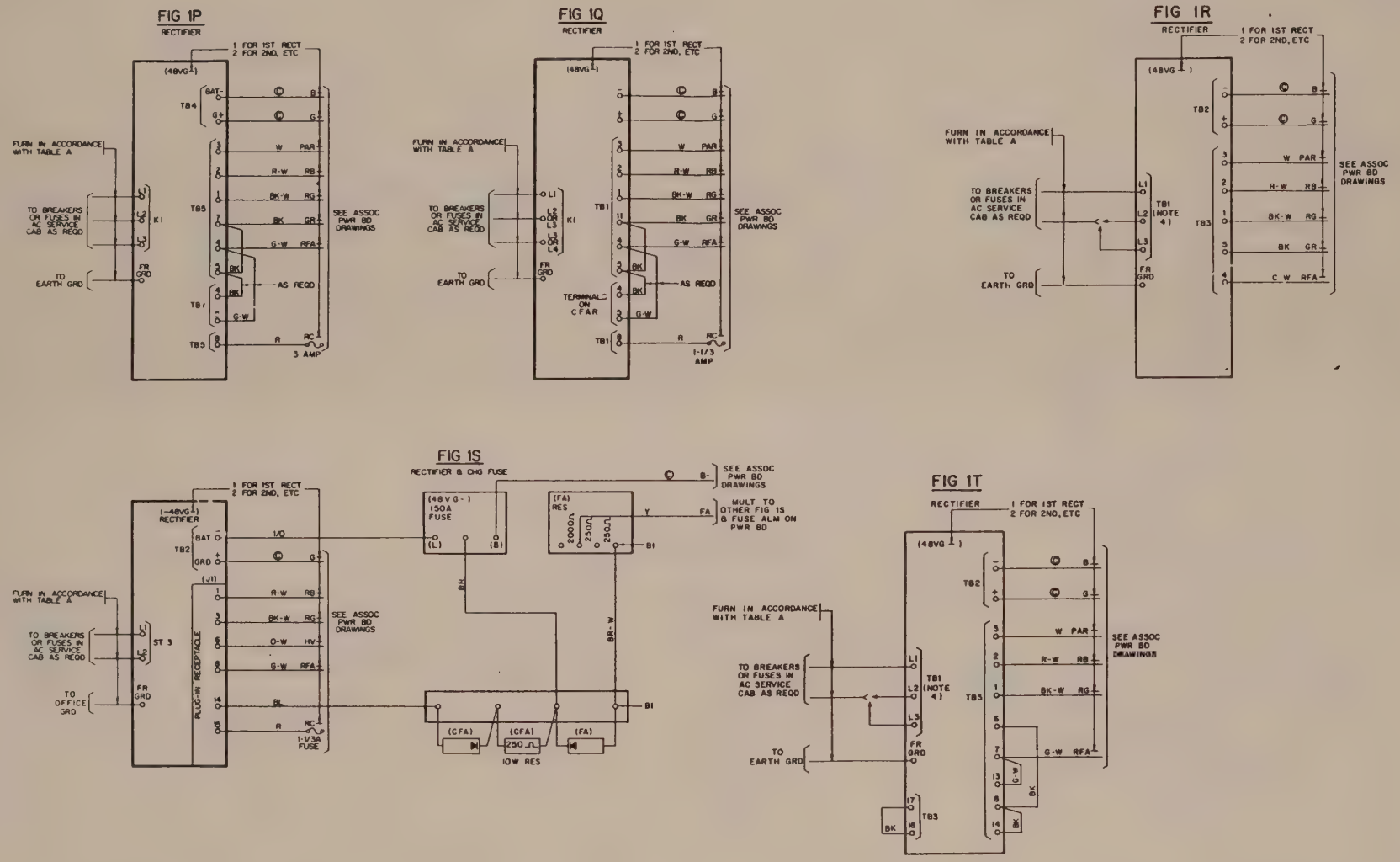


FIG 1N
RECTIFIER

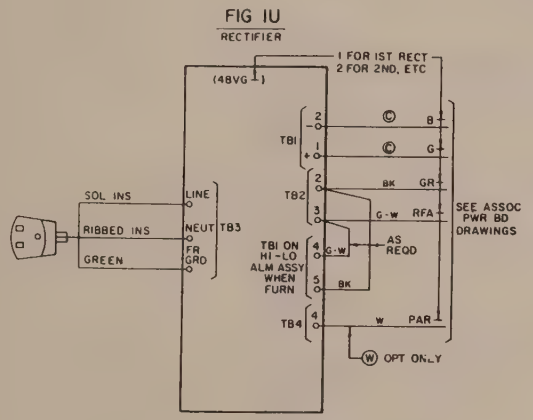


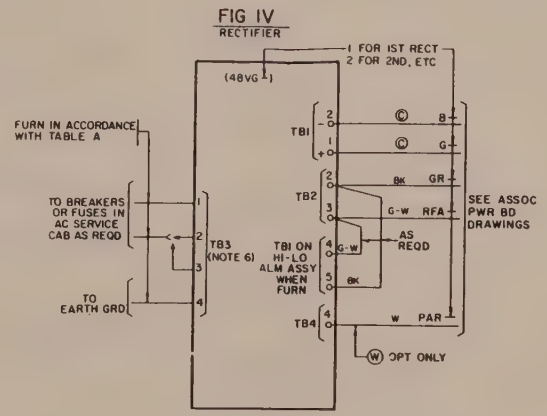
ISSUE 3

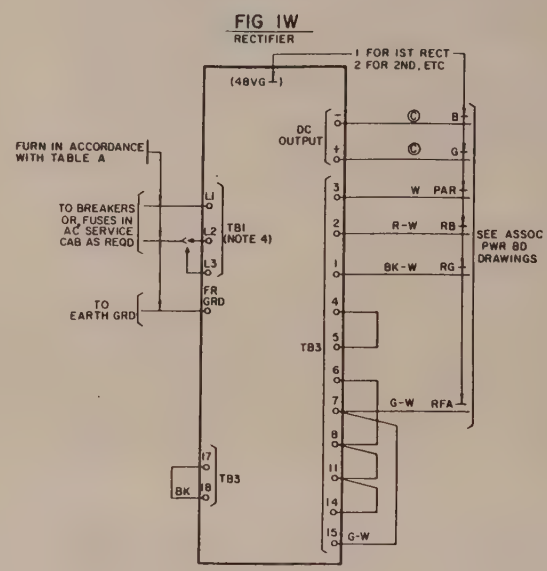
48 VOLT RECTIFIER WIRING	0311-916
LORAIN PRODUCTS CORPORATION — DWG SIZE D	SHEET 3
PRINTED IN U.S.A.	

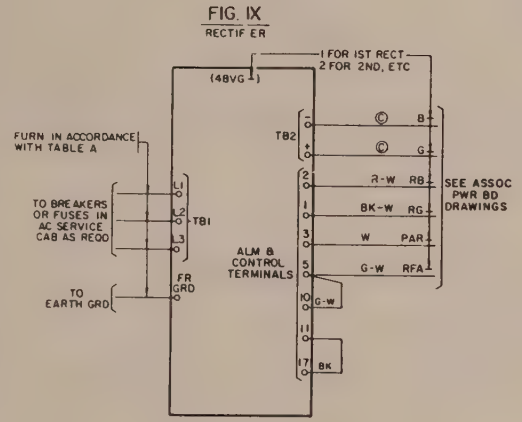


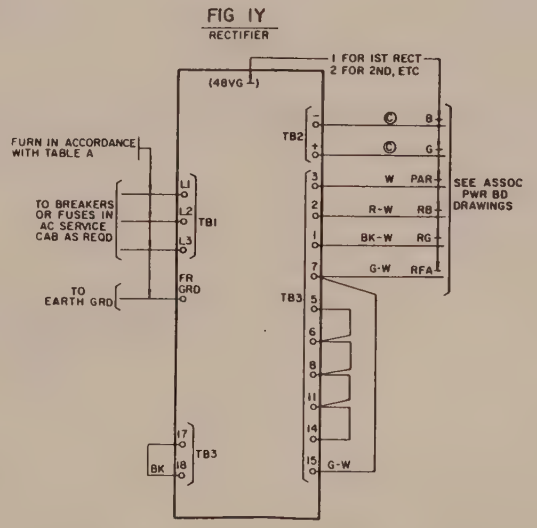
48 VOLT RECTIFIER WIRING	0311-916
LORAIN PRODUCTS CORPORATION	SHEET 4

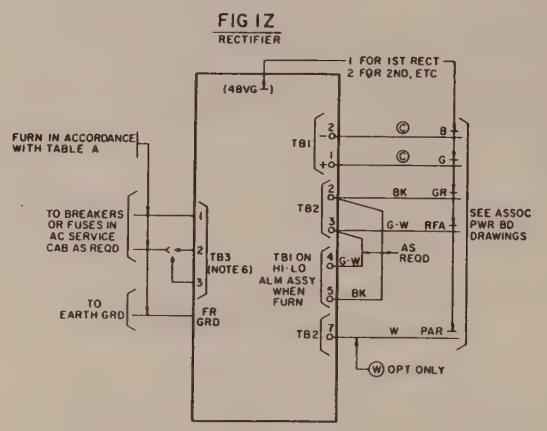








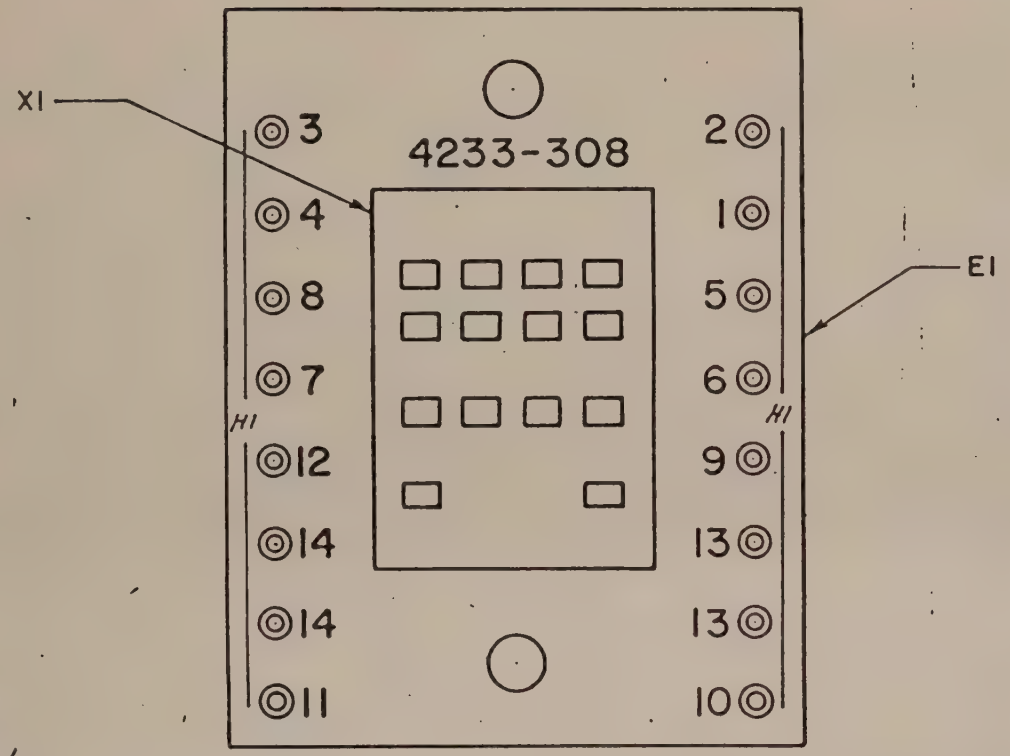




48 VOLT RECTIFIER WIRING	0311-916
LORAIN PRODUCTS CORPORATION	SHEET 5

3

FIG. 1



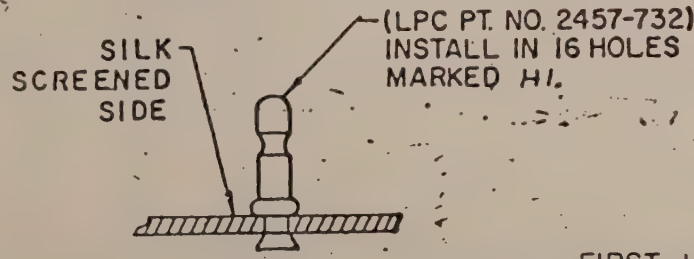
ISS NO.	CHGD BY / CHG SLIP NO.	DATE	REVISION
1	M		NEW
2	1831975 E.SONGS Ch A Muela 7-13-72	7 12M 72	ADDITIONAL COIL TERMS. ADDED R.J. Indelli 7-17-72
3	1836461 M		TERMINALS ADDED W. Glick 5/17/77

Note

1. THIS ASSEMBLY TO BE BUILT ON P.C. BOARD 3153-045

FIG. 2

TERMINAL INSTALLATION



FIRST USED ON MODEL PDR153B

FIRST USED ON	MODEL	
	NEXT ASSY	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCE ON FRACTIONS ±1/32 DECIMALS ±0.031 ANGLES ±1.8°

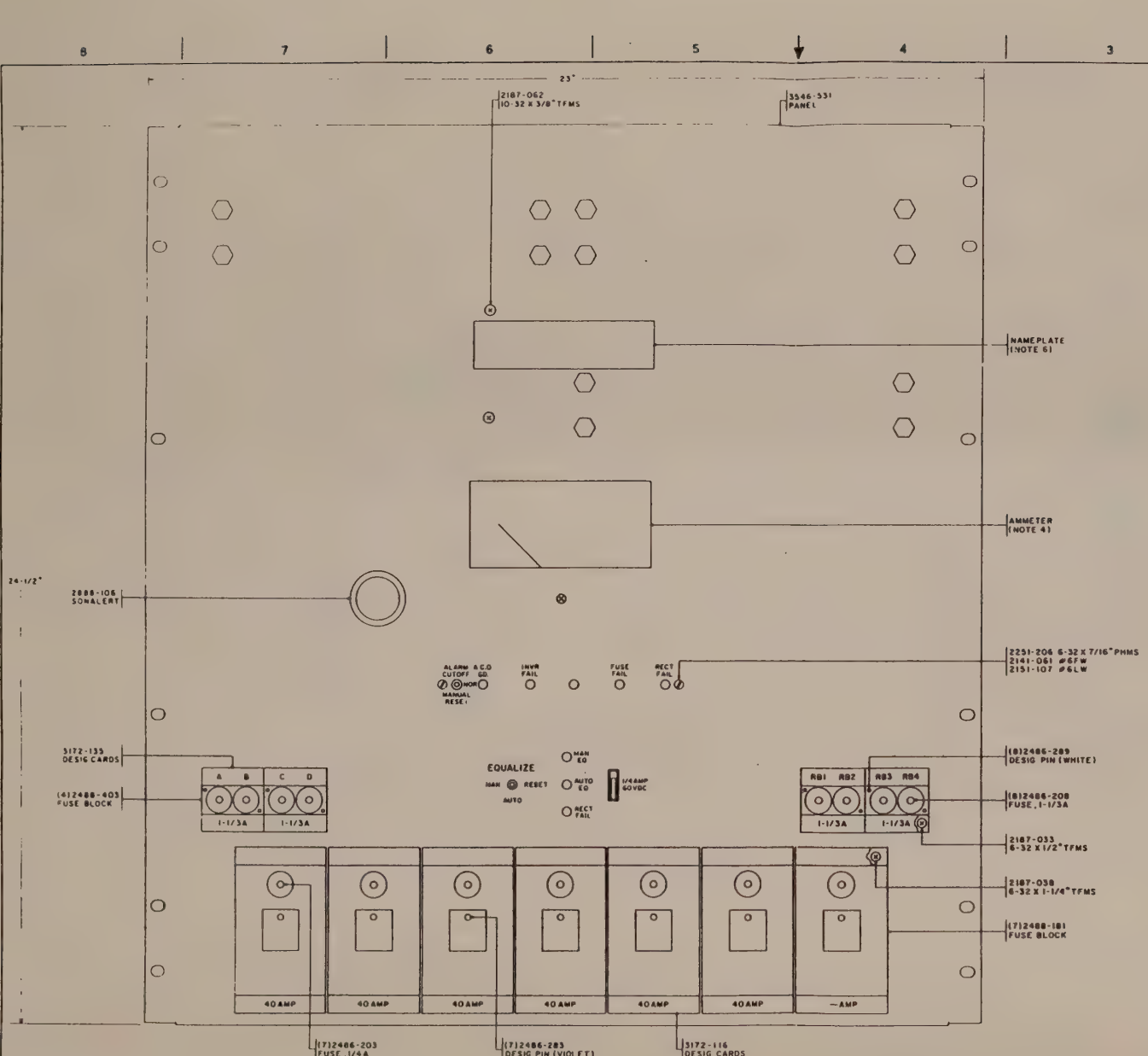
SIZE A

ASSEMBLY DRAWING FOR RELAY BOARD

LORAIN Products Corporation
LORAIN, OHIO
LORAIN PRODUCTS (CANADA) LTD.
ST. THOMAS, ONTARIO

DRAWN BY J.PARKER	DATE 1-7-69	SCALE 2/1
DESIGNED BY T. BAILEY	DATE 11-8-68	DO NOT SCALE
CHECKED BY A Muela	DATE 1-10-69	4233-308
APPROVED BY A.J.J.	DATE 1-10-69	

LP-328-R1



REVISIONS			
NO	LTR SHT OR REV	DATE	DESCRIPTION
1	NEW	BP	MAY 3 1984

NOTES:

1. STAMP ASSEMBLY NUMBER AND ISSUE NUMBER IN 3/16" BLACK CHARATERS
2. ALL STAMPING TO BE 3/16" BLACK CHARACTERS UNLESS OTHERWISE SPECIFIED
3. DESIGNATIONS IN ( ) ARE SHOWN FOR REFERENCE ONLY
4. AMMETER AND SHUNT ARE FURNISHED WITH POWER BOARD ACCORDING TO CAPACITY REQUIRED
5. CONNECT WIRE HARNESS 4946-011 PER T-4374-149
6. NAMEPLATE IS FURNISHED WITH POWER BOARD AND TO BE MOUNTED ON THIS ASSEMBLY AS SHOWN
7. DOTTED LUGS ARE FURNISHED WITH POWER BOARD ACCORDING TO CAPACITY OF PLANT AS SHOWN BELOW:
   LIST 1 AND 2 - 6-4/0 (2456-338)
   LIST 3 AND 4 - 1/0-300MCM (2456-346)

FIRST USED ON	NEXT ASSY	5821-052
	MODEL NO	200CBX

LORAIN PRODUCTS CORPORATION
LORAIN, OHIO
A Subsidiary of Reliance Electric Co.

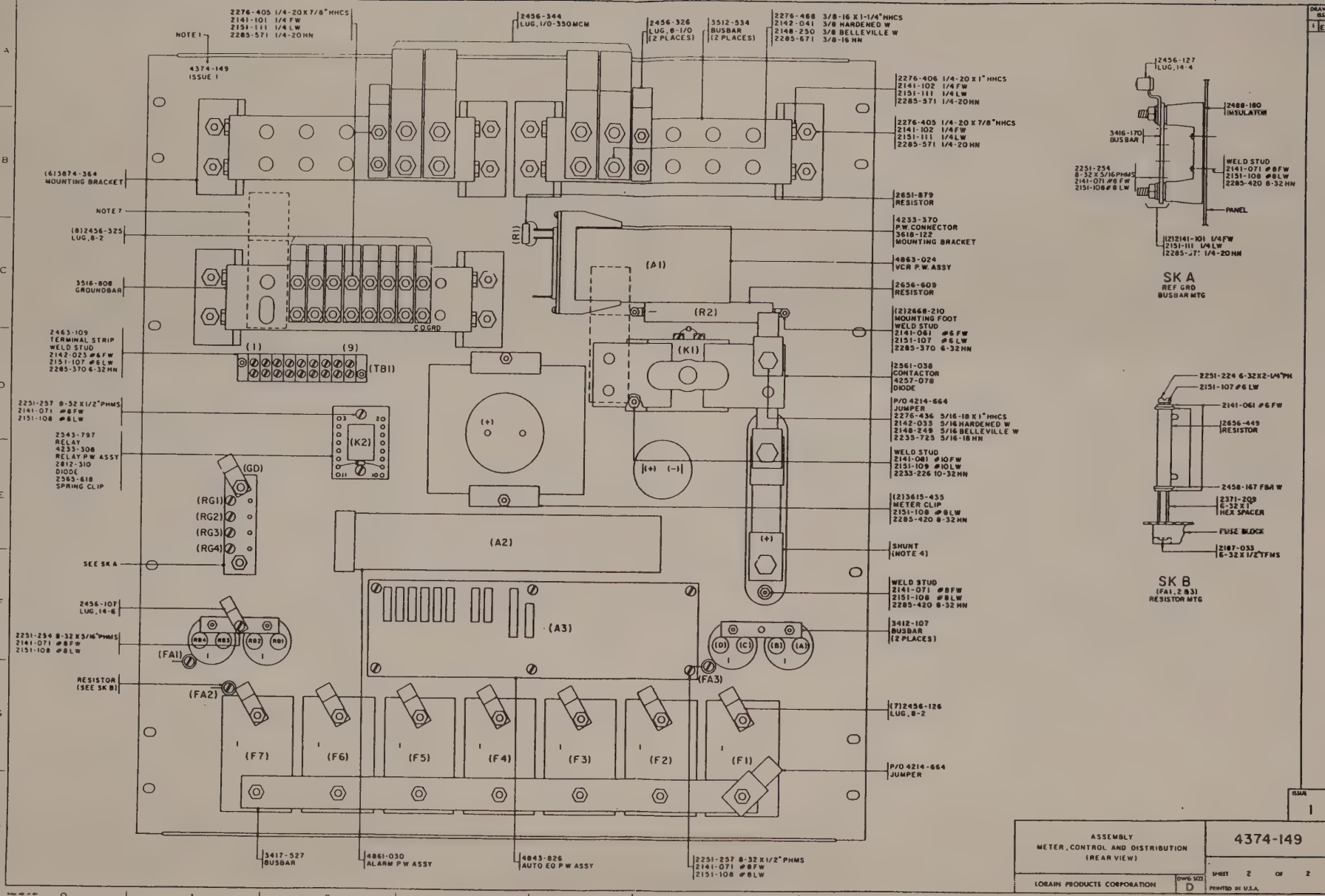
ASSEMBLY,
METER, CONTROL AND DISTRIBUTION
(24-1/2" X 23" R.R. MTG.)

DRAWN	F GARTON	4-15-82
TRACED	R MONEY	4-15-82
CHECKED		4-16-82
ENGINEER		
APPROVED		

DO NOT SCALE DWG

4374-149

SHEET 1 OF 2



ISSUE 1

ASSEMBLY METER, CONTROL AND DISTRIBUTION (REAR VIEW)	4374-149
LORAIN PRODUCTS CORPORATION	DWG SIZE D — SHEET 2 OF 2 — PRINTED IN U.S.A.

STOCKLIST

ITEM	NOTE	DESCRIPTION	PART NO.	LIST 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	SHOP	INST
1		RELAY RACK, 7'-0" X 24"	4124-010	1	1	1	1	1																X	
		METER, CONT. & DIST PNL	4374-149	1	1	1	1																		X
5		BAFFLE, 5-1/4" X 23"	3777-617						1																
		AMMETER, 0-50A	2925-320	1																					
		,0-100A	2925-324		1																				
10		,0-200A	2925-328			1																			
		,0-300A	2925-330				1																		
		SHUNT, 50A	2982-710	1																					
15		,100A	2982-712		1																				
		,200A	2982-714			1																			
		,300A	2982-656				1																		
20		RECTIFIER, RL50F50	5431-026							1															
		,RL100F50	5451-019								1														
		,RHM200050	5472-014									1													
		,RL50F50	5431-025										1												
		,RL100F50	5452-009											1											
25		,RHM200C50	5475-010												1										
		INVERTER, WAA5018	5173-302													1									
		,WAA1028	5174-315														1								
30		,WAA2028	5175-306															1							
35																									
		FUSE, 30A	2483-515													1									
		,40A	2483-519	6	6	6	6																		
		,50A	2483-523														1								
		,60A	2483-525															1							
40																									
		FUSE REDUCER	2488-705													1									
45		LUG, 6-4/0	2456-338	2	2																				
		,1/0-500MCM	2456-346			2	2																		
		REAR COVER	4141-013	1	1	1	1																		
50																									
		NAMEPLATE	3184-701	1	1	1	1																		
55		BLANK PNL, 5-1/4" X 23"	3533-106													1									
60																									
65																									
70																									
75																									
80																									

MANUF

1. RECTIFIER DESIG
BLACK CHARACTE
BE 3/16" UNLESS

2. ASSEMBLE PER S
ARRANGEMENTS
IS FURNISHED.

TA

ROLM SPECIFICATION NUMBER
VSCBXN500
VXCBXR500
VSCBXN1000
VSCBXR1000
VSCBXN2000
VSCBXR2000
IMCBXN500
IMCBXR500
IMCBXN1000
IMCBXR1000
IMCBXN2000
IMCBXR2000
2MCBXN500
2MCBXR500
2MCBXN1000
2MCBXR1000
2MCBXN2000
2MCBXR2000
3MCBXN500
3MCBXR500
3MCBXN1000
3MCBXR1000
3MCBXN2000
3MCBXR2000
4LCBXN500
4LCBXR500
4LCBXN1000
4LCBXR1000
4LCBXN2000
4LCBXR2000
5LCBXN500
5LCBXR500
5LCBXN1000
5LCBXR1000
5LCBXN2000
5LCBXR2000
6LCBXN500
6LCBXR500
6LCBXN1000
6LCBXR1000
6LCBXN2000
6LCBXR2000

5 | 6 | 7 | 8 | 9

ES

TO BE 1/4"
R STAMPING TO
PECIFIED.

IPMENT
AL JOB PROFILE

TABLE A

A EQUIPMENT (ENGINEERING INFORMATION)		B RATING	C LIST	D NO	E CIRCUIT & FIGURES EQUIPPED	SCHEMATIC INFORMATION S NUMBER	FIG	OPT
COMMON EQUIPMENT, WIRING AND ASSEMBLY FOR ONE -48V POWER BOARD	50A		1	1	T-5821-052 FIG 4	SD-5821-052	3, 5-12	
	100A		2					
	200A		3					
	300A		4					
SUPPLEMENTAL RELAY RACK			5					
HEAT BAFFLE			6					
RECTIFIER, 60HZ	RL50F50		7	1	T-5821-052 FIG 1	SD-5821-052	1	
	RL100F50		8					
	RHM200D50		9	1	T-5821-052 FIG 2	SD-5821-052	2	
RECTIFIER, 50-60HZ	RL50F50		10	1	T-5821-052 FIG 1	SD-5821-052	1	
	RL100F50		11					
	RHM200C50		12	1	T-5821-052 FIG 2	SD-5821-052	2	
INVERTER EQUIPPED WITH #1 TRANSFER CIRCUIT	WAA501B		13	1	T-5821-052 FIG 3	SD-5821-052	13	
	WAA102B		14					
	WAA202B		15					

REVISIONS

		DATE	DESCRIPTION
1 pp	MAY 3 1982		M
ITEM 37 PT. NO. CORRECTED. TABLE B, CORRESPONDING LIST NO'S UPDATED. NOTE 52 ADDED.			
2 1837844	BP. NOV 16 1982	11-12-82	D.A.C.
A Garrard 11-16-82			M

PONDING
UMBERS

7 & 13
(2)7 & 13
& 14
,(2)7 & 14
& 15
,(2)8 & 15
& 13
(2)7 & 13
& 14
,(2)7 & 14
& 15
,(2)8 & 15
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,(2)9 & 14
& 15
,(2)9 & 15
& 13
(2)9 & 13
,(2)9 & 14
,(2)9 & 14
,(2)9 & 15
,(2)9 & 15

ENGINEERING NOTES

51. EQUIPMENT TO BE ORDERED BY SPECIFICATION AND LIST NUMBER PER TABLE B.

52. INVERTERS ARE EQUIPPED WITH TRANSFER #1 ACCESSORY.

1846736

POWER SYSTEMS

EQUIPMENT AND ASSEMBLY
50-300 AMP, -48 VOLT
POWER BOARD

MODEL 200C8X

LORAIN PRODUCTS CORPORATION
LORAIN, OHIO

DWG SIZE D

DESIGN	E.GARTON	ES 2
DRAWN BY	E.GARTON	DATE 4-15-82
CHECKED BY	E Garton	DATE 4-27-82
APPROVED BY		DATE
APPROVED BY	D Garrard	DATE 4-27-82
RATING	STANDARD	

J-5821-052

SHEET 1 OF 2

5 | 6 | 7 | 8 | 9 PRINTED IN U.S.A.

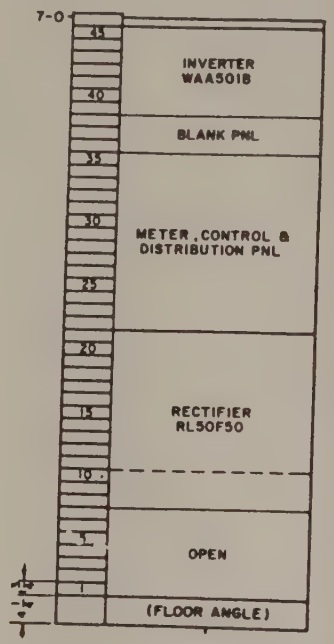


FIG 1
LIST 1 E/W 13 AND 7 OR 10

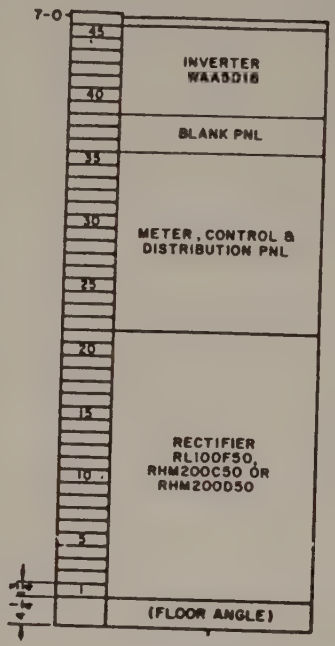


FIG 2
LIST 2, 3 OR 4 E/W 13 AND 8, 9, 11 OR 12

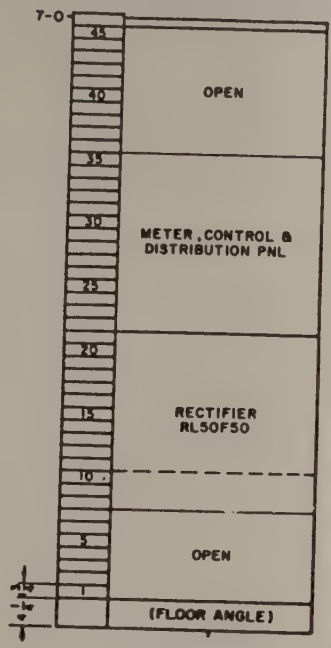


FIG 3
LIST 2 E/W 7 OR 10

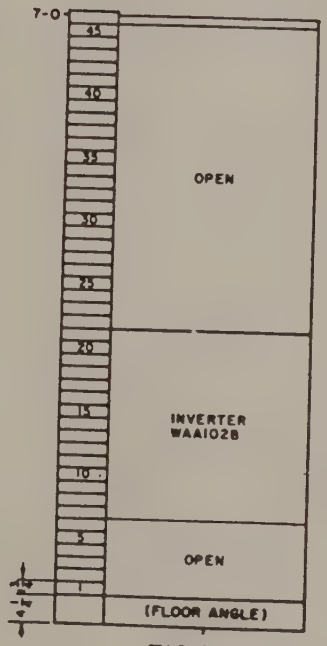


FIG 6
LIST 5 E/W 14

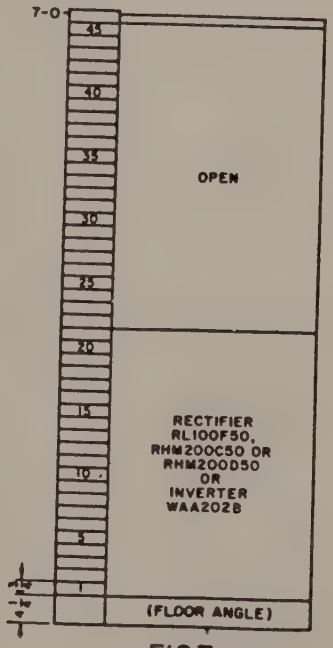


FIG 7
LIST 5 E/W 8, 9, 11, 12 OR 15

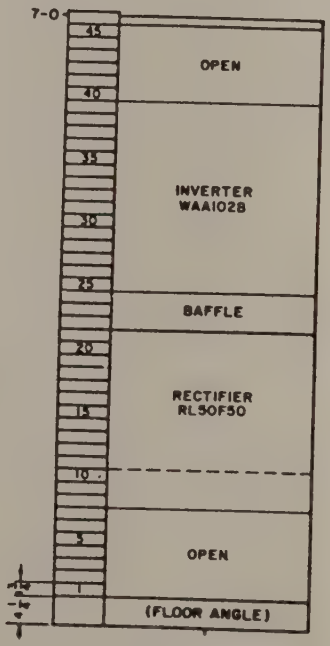


FIG 8
LIST 5 E/W 6, 14 AND 7 OR 10

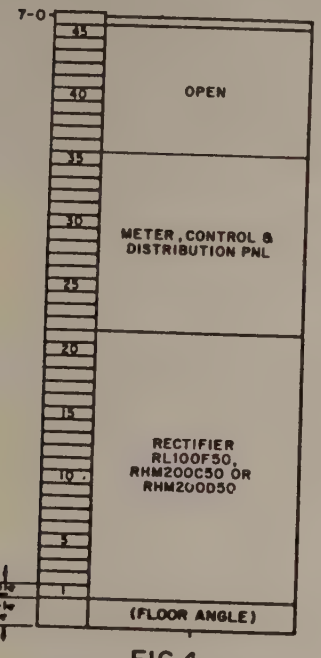


FIG 4
LIST 2,3 OR 4 E/W 8,9,11 OR 12

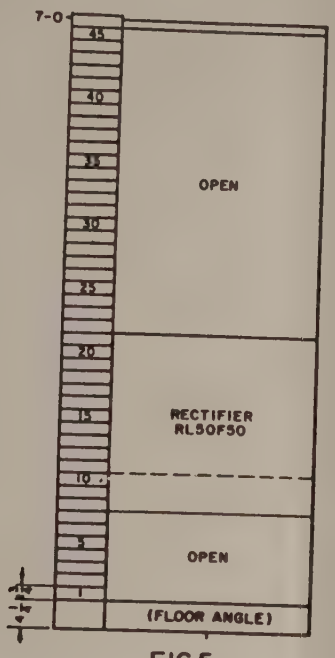


FIG 5
LIST 5 E/W 7 OR 10

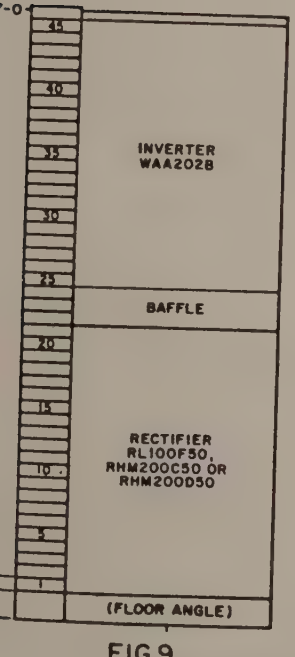


FIG 9
LIST 5 E/W 6,13 AND 8,9,11 OR 12

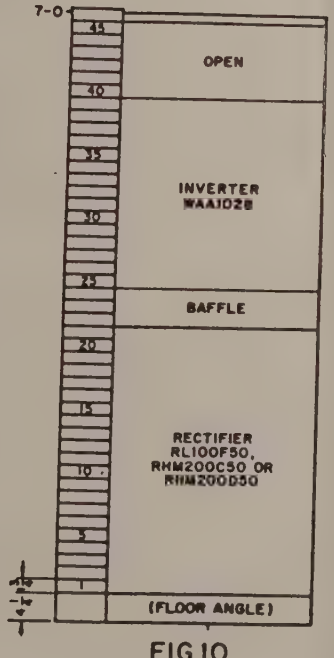


FIG 10
LIST 5 E/W 6,14 AND 8,9,11 OR 12

DRAWING ISSUE
1 E.O.
2

ISSUE 2

MODEL 200CBX

J-5821-052

LORAIN PRODUCTS CORPORATION

DWG SIZE D

SHEET 2 OF 2

PRINTED IN U.S.A.

SHEET INDEX

SHEET NO.	CONTENTS
1.	SHEET INDEX CIRCUIT NOTES SUPPORTING INFORMATION OPTION INDEX INFORMATION NOTES
2.	FIG 1 RL TYPE RECTIFIERS FIG 2 RHM TYPE RECTIFIERS FIG 3 CHARGE LEADS FIG 4 -48V BATTERY FIG 5 LOW VOLTAGE DISCONNECT FIG 6 DISTRIBUTION FUSES FIG 7 RECTIFIER REFERENCE FUSES FIG 8 AUTOMATIC EQUALIZE
3.	FIG 9 CONTROL FUSES FIG 10 ALARM TERMINATION FIG 11 FUSE ALARM RELAY FIG 12 AUDIBLE VISUAL ALARM FIG 13 INVERTER

OPTION INDEX

APP OR WRG	LOCATION

SUPPORTING INFORMATION

CATEGORY	NO.
EQUIPMENT DRAWING	J-5821-052
WIRING DIAGRAM	T-5821-052 T-4374-149

INFORMATION NOTES

301. UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS. FUSE VALUES ARE IN AMPERES.

302. LEAD AND EQUIPMENT DESIGNATIONS FOLLOWED BY A DASH (-) INDICATE CIRCUIT AND EQUIPMENT NUMBERING: 1 FOR 1ST (FIGURE, CKT OR EQPT), 2 FOR 2ND ETC.

303. ALL RELAYS ARE SHOWN RELEASED.

CIRCUIT NOTES

101.

FEATURE OR OPTION		PROVIDE FIG	PROVIDE APP OR WRG	PROVIDE QUANTITY
-48V RECTIFIER	RL TYPE	1		AS REQD
	RHM TYPE	2		
-48V PLANT		3,5-12		ONE PER PLANT
INVERTER		13		AS REQD

102. REFER TO T-5821-052 FOR CABLING INFORMATION AND WIRE CALCULATION.

103. INVERTER FAIL ALARM IS INDICATED BY A CLOSED CIRCUIT BETWEEN TERMINAL 2 AND 3 AND AN OPEN CIRCUIT BETWEEN TERMINAL 1 AND 2 OF TB1.

104. RECTIFIER FAIL ALARM IS INDICATED BY A CLOSED CIRCUIT BETWEEN TERMINAL 4 AND 5 AND AN OPEN CIRCUIT BETWEEN TERMINAL 5 AND 6 OF TB1.

105. FUSE FAIL ALARM IS INDICATED BY A CLOSED CIRCUIT BETWEEN TERMINAL 7 AND 8 AND AN OPEN CIRCUIT BETWEEN TERMINAL 8 AND 9 OF TB1.

106. THIS LEAD IS CONNECTED TO TB1 TERMINAL 5 FOR USE WITH MODEL RHM200050 SPEC NUMBER 5472-014; OTHERWISE CONNECT TO TB1 TERMINAL 7.

MAY 3 1992				M

1846736		ISSUE 1
POWER SYSTEMS CHARGE-DISCHARGE CIRCUIT 50-230 AMP, -48 VOLT MODEL 200CBX	DRAWN BY R. HONEY	DATE 4-2-82
	CHECKED BY	DATE 4-13-82
	APPROVED BY	DATE
	APPROVED BY	DATE
	RATING STANDARD	
	SD-5821-052	
LORAIN PRODUCTS CORPORATION LORAIN, OHIO LORAIN PRODUCTS (CANADA) LTD., ST THOMAS, ONTARIO	DWG SIZE D	3 SHEETS PRINTED IN U.S.A.
		SHEET 1

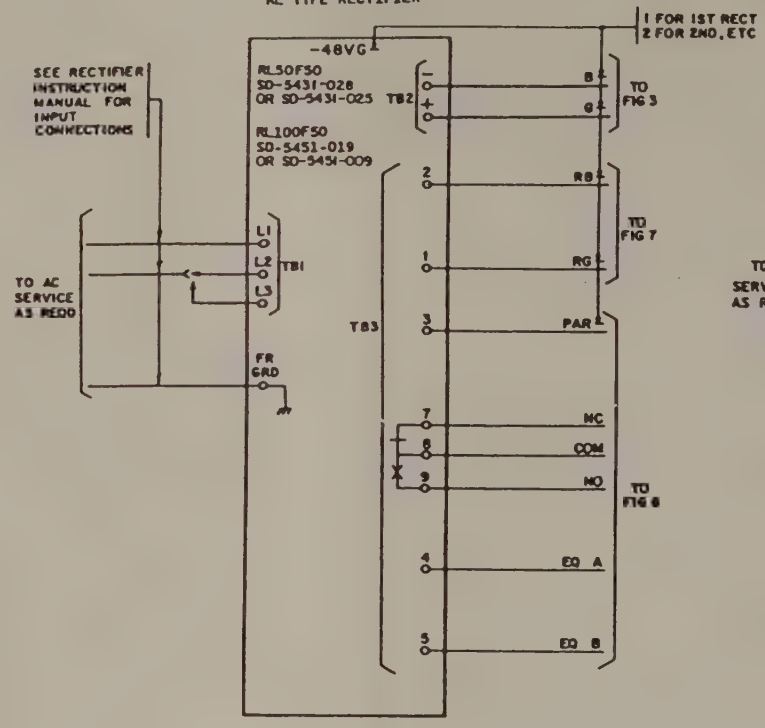


FIG 1
RL TYPE RECTIFIER
1 FOR 1ST RECT
2 FOR 2ND, ETC
-48VG
SEE RECTIFIER INSTRUCTION MANUAL FOR INPUT CONNECTIONS
RL50F50
SD-5431-028
OR SD-5431-025
TB2
RL100F50
SD-5451-019
OR SD-5451-009
TO FIG 3
TO FIG 7
TO FIG 8
TO AC SERVICE AS REQD
L1
L2
L3
TB1
FR GRD
TB3
RB
RG
PAR
MC
COM
NO
EQ A
EQ B

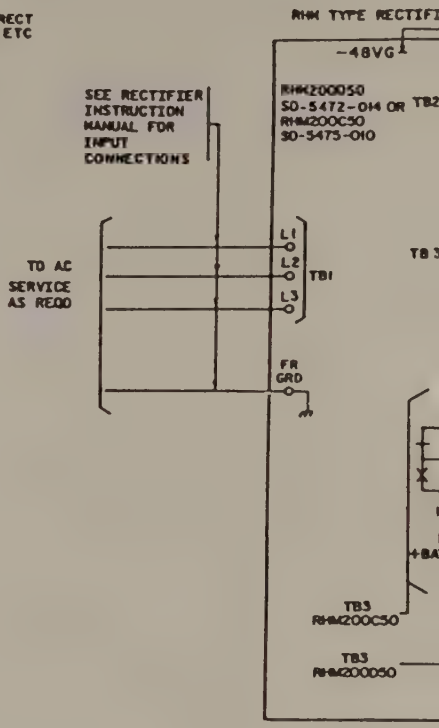


FIG 2
RHK TYPE RECTIFI
-48VG
SEE RECTIFIER INSTRUCTION MANUAL FOR INPUT CONNECTIONS
RHK200050
SD-5472-014 OR
RHM200C50
SD-5473-010
TO AC SERVICE AS REQD
L1
L2
L3
TB1
FR GRD
TB3
RHM200C50
TB3
RHM200050

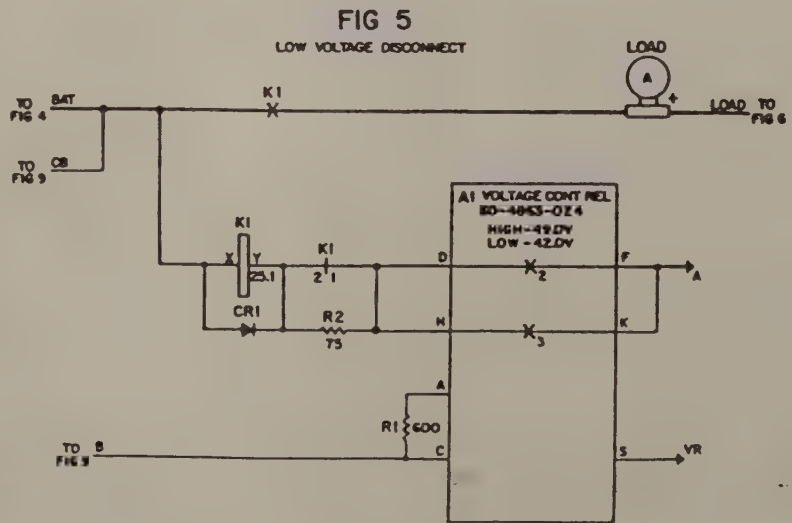
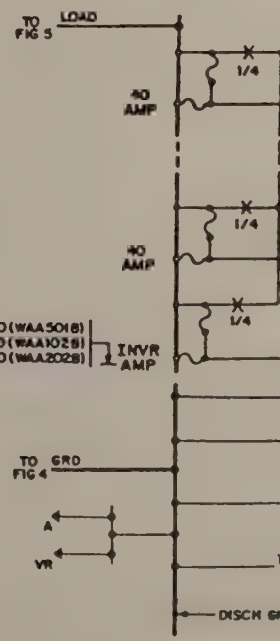


FIG 5
LOW VOLTAGE DISCONNECT
LOAD
TO FIG 4 BAT
TO FIG 9 CB
K1
LOAD TO FIG 6
A1 VOLTAGE CONT REL
ED-48453-024
HIGH-49.0V
LOW-42.0V
CR1
R2
75
R1 600
TO FIG 9 B
VR


TO FIG 5 LOAD
1/4
40 AMP
1/4
40 AMP
1/4
30(WAA50I8)
50(WAA102B)
60(WAA202B)
INVR AMP
TO GRD FIG 4
A
VR
DISCH

DRAWING ISSUE 1 P.N.

FIG 3
CHARGE LEADS

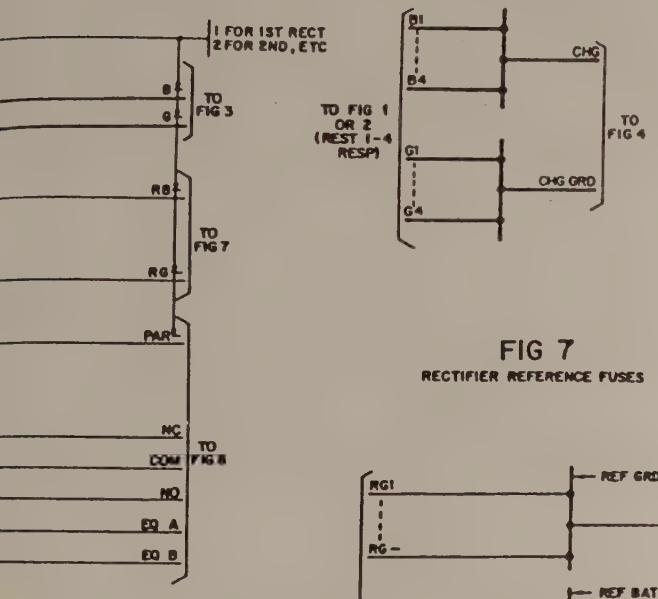


FIG 4
-48V BATTERY

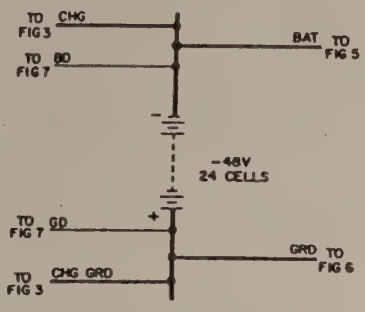


FIG 7
RECTIFIER REFERENCE FUSES

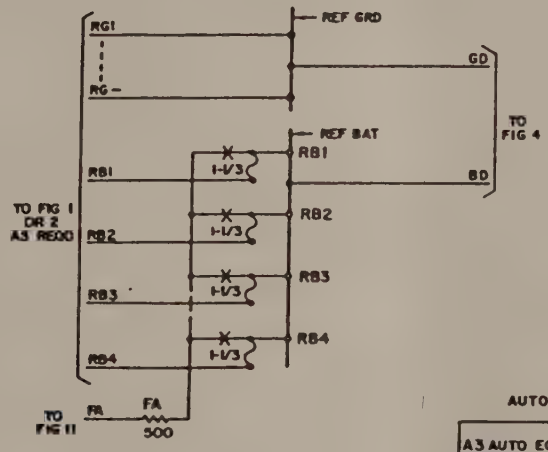
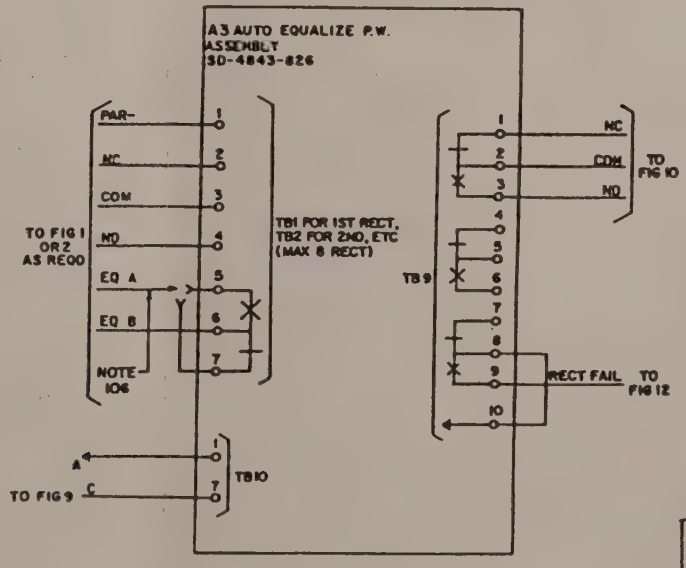
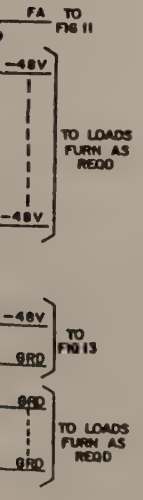


FIG 8-
AUTOMATIC EQUALIZE





ISSUE 1

MODEL 2000BX	SD-5821-052
LORAIN PRODUCTS CORPORATION — DWG SIZE D	SHEET 2 OF 3 — PRINTED IN U.S.A.

FIG 9
CONTROL FUSES

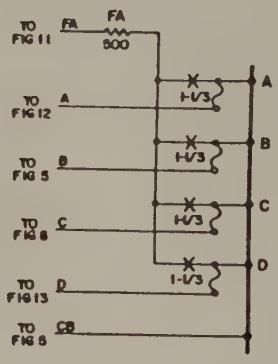


FIG 10
ALARM TERMINATION

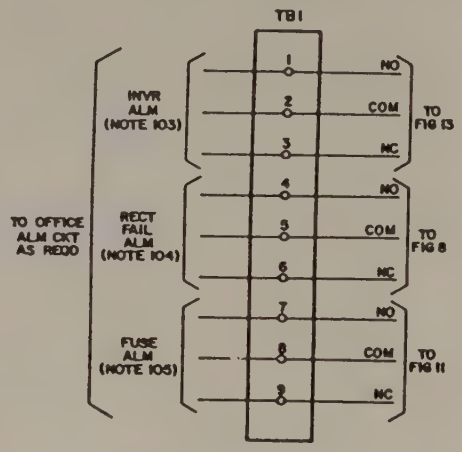
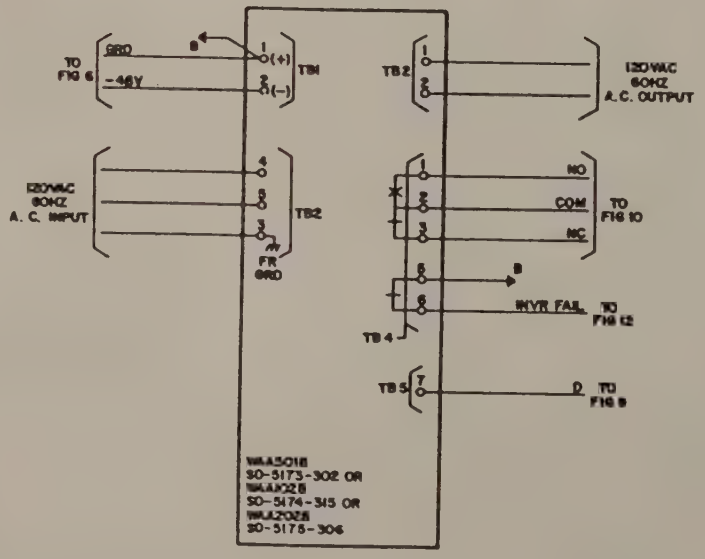


FIG 13
INVERTER



DRAWING ISSUE 1 2 3 4

FIG 11
FUSE ALARM RELAY

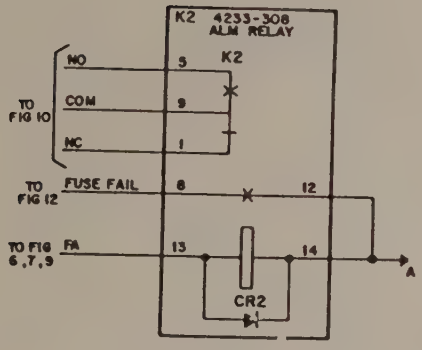
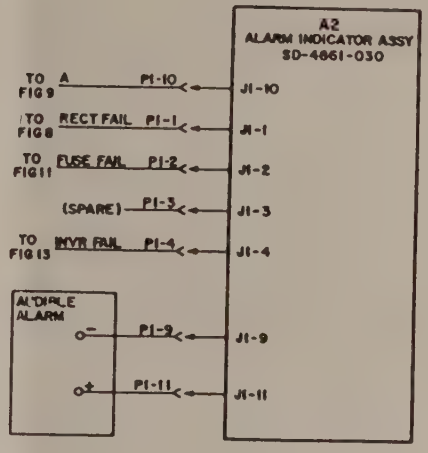


FIG 12
AUDIBLE VISUAL ALARM



A B C D E F G H

ISSUE 1

MODEL 2000BX	SD-5821-052
LORAIN PRODUCTS CORPORATION — DWG SIZE D	SHEET 3 OF 3
	PRINTED IN U.S.A.

COMPONENT LIST

CAPACITOR

	DESIG	CODE	
	C1	(2737-133)	4.7UF, 35VDC, TANTALUM
(2)	C2,8	(2737-134)	10UF, 20VDC, TANTALUM
(2)	C3,4	(2724-139)	0.001UF, 1000VDC
	C5	(2731-125)	47 UF, 50VDC
	C6	(2713-133)	0.1 UF
	C7	(2713-118)	0.01UF

DIODE

	DESIG	CODE	
(11)	CR1,4,5,6,7,8,9, 10,11,12,13	(2812-223)	
(2)	CR2,3	(2835-325)	6.2V, 0.4W ZENER

DIODE

	DESIG	CODE	
(2)	DS1, DS2	(2818-131)	LED, YELLOW
	DS3	(2818-124)	LED, RED

E CELL

DESIG	CODE	
M1	(2877-102)	MICRO-COULOMETER

FUSE

DESIG	CODE	
F1	(2486-102)	1/4A GMT

INTEGRATED CIRCUITS

	DESIG	CODE	
	A1	(2871-112)	NORTON AMPLIFIER
	A2	(2876-342)	QUAD 2 INPUT NAND GATE
	A3	(2876-801)	QUAD BI-LATERAL SWITCH
	A4	(2876-308)	QUAD 2 INPUT NOR GATE
(2)	A5,6	(2876-501)	14 STAGE RIPPLE-CARRY BINARY COUNTER
	A7	(2871-001)	TIMER

RESISTOR

	DESIG	CODE	
	R20	(2634-670)	274K, 1/4 W
	R36	(2634 690)	75K, 1/4 W
	R2	(2634-693)	82.5K, 1/4W ±1%
(2)	R3,23	(2635-748)	392K, 1W ±1%
	R4	(2634-714)	221K, 1/4W
	R5	(2634-696)	100K, 1/4W
	R6	(2634-688)	68.1K, 1/4W
	R7	(2615-339)	1.5 MEGO, 1/2W
	R8	(2634-681)	47.5K, 1/4W
(3)	R9,15,17	(2615-327)	470K, 1/2W
(2)	R10,11	(2615-335)	1MEGO, 1/2W
	R12	(2615-323)	330K, 1/2W
(2)	R13,38	(2635-801)	2MEGO, 1W ±1%
	R14	(2634-601)	1.21K, 1/4W ±1%
(2)	R16,40	(2635-721)	12IK, 1W
	R18	(2615-351)	4.7 MEGO, 1/2W
	R19	(2651-544)	1K, 6.5W
	R21	(2651-171)	390, 3W
(3)	R22, 35,25	(2634-632)	4.75K, 1/4W
	R24	(2675-126)	50K, 1/2W POT
	R34	(2634-648)	10K, 1/4W
	R26	(2651-330)	600, 3W
	R27	(2651-337)	1.2K, 3W
	R28	(2634-684)	56.2K, 1/4W
(2)	R29, 32	(2634-623)	3.32K, 1/4W
	R30	(2634-662)	18.2K, 1/4W
	R31	(2634-609)	1.82K, 1/4W
	R33	(2634-582)	475, 1/4W
(2)	R37,43	(2634-665)	22.1K, 1/4W
	R39	(2635-787)	1.21M, 1W
	R41	(2635-761)	665K, 1W
	R42	(2635-750)	422K, 1W

RELAY

DESIG	CODE	
(3) K1, 2, 3	(2543-428)	1200 OHM, 4C

SWITCH

DESIG	CODE	
S1	(2513-603)	DPDT
S2	(2513-566)	SW 8POLE

TRANSISTOR

DESIG	CODE
Q1	(2841-036)
Q2	(2841-100)
(2) Q3,4	(2841-038)

NOTES.

1. UNLESS OTHERWISE SPECIFIED, R
   VALUES ARE IN OHMS AND CAPACI
   VALUES ARE IN MICROFARADS; VA
   PRECEDED BY THE SYMBOL +(PLUS)
   -(MINUS) ARE IN VOLTS.
2. NORMAL OPERATION IS ON 48 VOL
   OPTION (A) IS FOR OPERATION O
   8ATTERY.
3. CODES WITHIN PARENTHESES AS (
   REPRESENT LPC PART NUMBERS
4. FOR EXTENSION OF CIRCUIT BEYOND 8
   SEE SO-4043-829 FOR ACCESSORY P
   CIRCUIT.

CIRCUIT DESCRIPTION

THIS CIRCUIT IS INTENDED AS AN AUTOMATIC EQUALIZE CONTROL FOR LORAIN RECTIFIERS.

WHEN THE BATTERY VOLTAGE IS BELOW FLOAT (ADJUSTABLE LIMIT SET BY R24), AND THE RECTIFIERS ARE NOT DELIVERING CURRENT, A SET CURRENT IS SENT THROUGH M1 BY ACTION OF THE TRANSMISSION GATES TO TURNING OFF Q1 AND TURNING ON Q2 AND Q3. WHEN THE RECTIFIERS RESUME CURRENT DELIVERING ABILITY THE CIRCUIT WILL SEND A CURRENT OF OPPOSITE POLARITY THROUGH M1 RESULTING IN Q3 REMAINING ON FOR A PERIOD OF TIME SELECTED BY SWITCH S2 TO GIVE 3, 6, OR 9 TIMES THE DURATION THAT THE BATTERY WAS BELOW FLOAT AND THE RECTIFIERS WERE OFF. Q3 TURNED ON, ILLUMINATES THE YELLOW LED (AUTO EQ) AND OPERATES RELAY K1 AND K2. RELAY K1 AND K2 PROVIDE TYPE C SETS OF CONTACTS TO OPERATE THE REMOTE EQUALIZE FEATURE OF UP TO EIGHT RECTIFIERS. AFTER THE EQUALIZE TIME HAS EXPIRED THE CIRCUIT WILL RETURN TO NORMAL CAUSING THE RECTIFIERS TO RETURN TO THE FLOAT MODE.

TO RETURN THE RECTIFIERS TO THE FLOAT MODE BEFORE THE EQUALIZE TIME HAS ELAPSED THE S1 SWITCH CAN BE MOMENTARILY PLACED IN THE "RESET" POSITION. IF THE CIRCUIT IS RESET, IT MUST STAY IN THE NORMAL MODE (NO EQUALIZE ALARM) FOR 2 MINUTES TO ALLOW INTERNAL CIRCUITRY TO RESET ITSELF BEFORE ANOTHER ALARM IS TURNED IN. AN INTERNAL TIMER, ALSO SET BY S2 WILL TERMINATE THE OFF TIMING CYCLE AFTER 100 HR FOR A X3 PERIOD, 50 HRS FOR A X6 PERIOD, AND 30 HRS FOR A X9 PERIOD, WHICH ALLOWS A MAX EQUALIZE TIME OF APPROX 300 HR FOR A X3 PERIOD, 300 HRS FOR A X6 PERIOD AND 270 HRS FOR A X9 PERIOD.

FOR MANUAL CONTROL OF THE EQUALIZE CHARGE MODE THE S1 SWITCH CAN BE PLACED IN THE "MAN" POSITION. THE YELLOW LED (MAN EQ) WILL ILLUMINATE AND RELAY K1 AND K2 WILL OPERATE. THE RELAY CONTACTS WILL OPERATE THE REMOTE EQUALIZE FEATURE OF THE RECTIFIERS UNTIL THE SWITCH IS RETURNED TO THE (AUTO EQ) POSITION.

FAILURE OF FUSE F1 OR PRESENCE OF BATTERY ON TERM. 2 OF TB1 THRU TB8 (WHEN CONNECTED TO THE RECTIFIERS) WILL ILLUMINATE RED-LED (RECT FAIL/FA) AND OPERATE RELAY K3. CONTACTS OF RELAY K3 PROVIDE 3 SETS OF C TYPE CONTACTS ON THE TERM. STRIP TB9 FOR CONNECTION TO OFFICE ALARM CIRCUITS.

TERMINAL STRIP TB10 PROVIDES CONNECTIONS FOR NEG BATTERY INPUT (TERM. 7) AND POS GROUND INPUT (TERM. 1). NORMAL OPERATION IS FOR 48 VOLT. FOR 24 VOLT APPLICATIONS STRAPPING OPTIONS (A) MUST BE PROVIDED.

TIMING SET-UP								
TIME MULTIPLIER	S2 POSITION (CL = CLOSED)							
	1	2	3	4	5	6	7	8
X3							CL	CL
X6				CL	CL			
X9	CL	CL						

REVISIONS			
2	1837458	3-9-81	R.H.
CIRCUIT REVISED FOR SELECTIVE TIMING.			
3	1837639	10-1-81	R.L.
A2(2876-312), R20(2634-670), R25(2634-632) AND R36(2634-690) WERE 2876-301, 2634-696, 2634-648 AND 2634-681 RESP.			
4	1837675	11-9-81	T.I.
#1 BYPASS CAPACITOR C8 ADDED			

MANUFACTURING REFERENCES

CATEGORY	NUMBER
ASSEMBLY DRAWING	4843-826
P.W. BOARD	3154-714
CONNECTOR ON FRAME	NONE

AUTO-EQUALIZE CONTROL

DESIGN	SH. 4
DRAWN BY E. GARTON	DATE 5-18-79
CHECKED BY	DATE 10-31-79
CHECKED BY	DATE
APPROVED BY B. W. HOWALD	DATE 2-5-80
RATING	

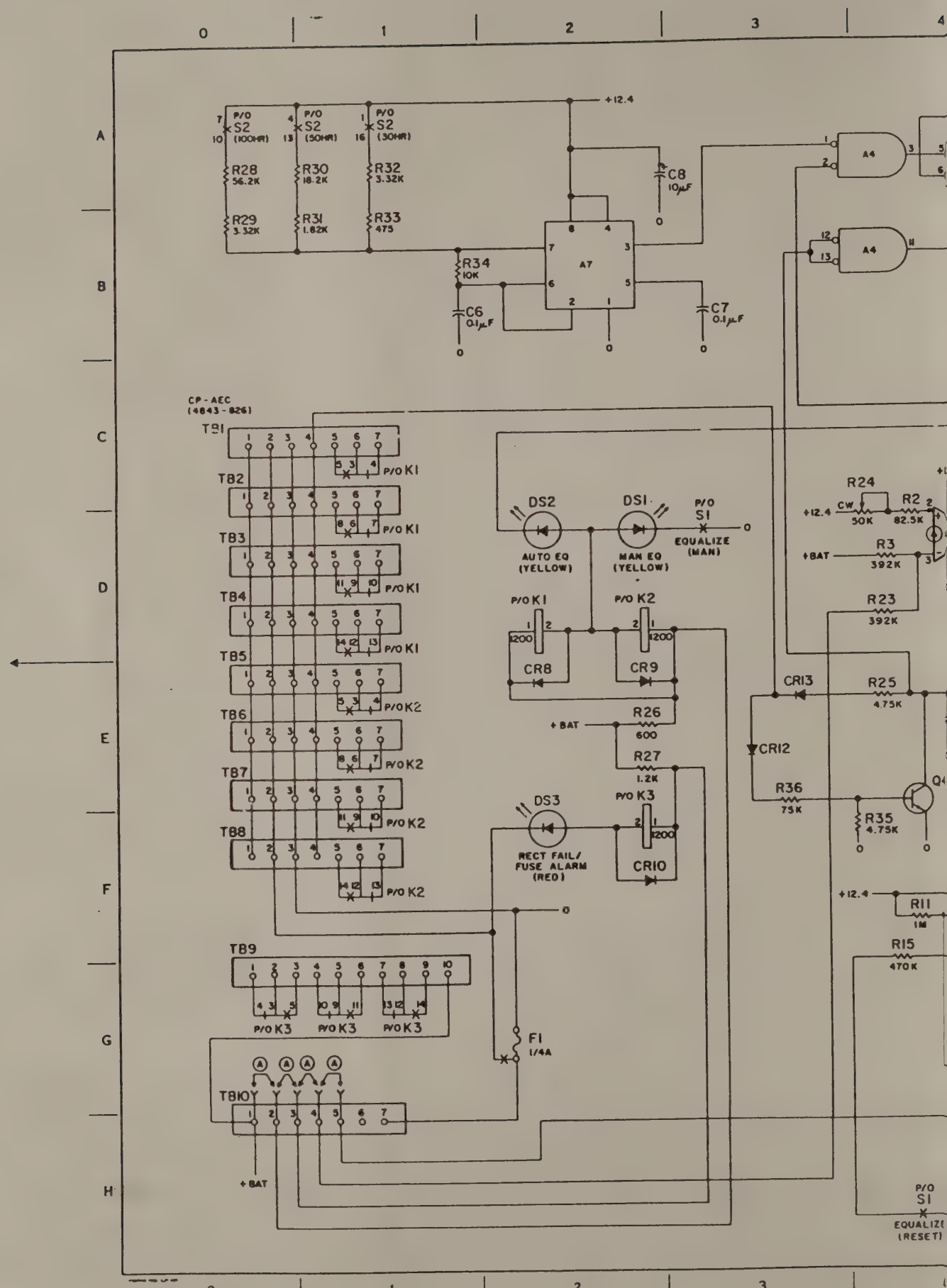
SD-4843-826

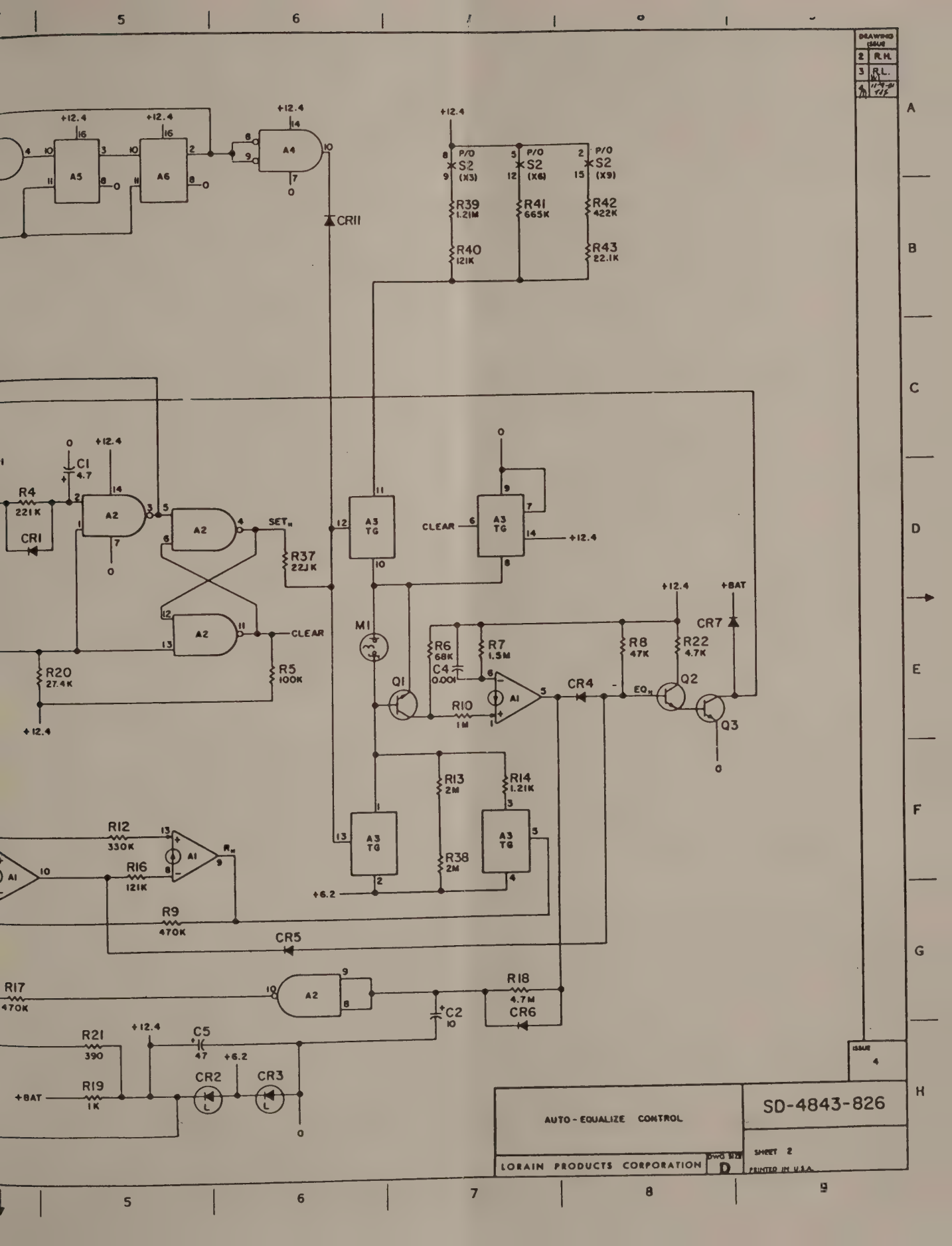
LORAIN PRODUCTS CORPORATION
LORAIN, OHIO
LORAIN PRODUCTS (CANADA) LTD., ST. THOMAS, ONTARIO

DWG SIZE D

SHEET 1 OF 2

PRINTED IN U.S.A.


P/O S2 (100HR)
P/O S2 (50HR)
P/O S2 (30HR)
R28 56.2K
R29 3.32K
R30 18.2K
R31 1.82K
R32 3.32K
R33 475
+12.4
C8 10µF
R34 10K
A7
C6 0.1µF
C7 0.1µF
A4
A4
CP-AEC (4843-826)
T81
T82
T83
T84
T85
T86
T87
T88
P/O K1
P/O K2
DS2
AUTO EQ (YELLOW)
DS1
MAN EQ (YELLOW)
P/O S1
EQUALIZE (MAN)
P/O K1
P/O K2
CR8
CR9
R26 600
+BAT
R27 1.2K
DS3
RECT FAIL/ FUSE ALARM (RED)
P/O K3
CR10
T89
P/O K3
P/O K3
P/O K3
F1 1/4A
T810
+BAT
R24
CW
R2 82.5K
50K
+12.4
R3 392K
+BAT
R23 392K
CR13
R25 4.75K
CR12
R36 75K
R35 4.75K
Q4
+12.4
R11 1M
R15 470K
P/O S1
EQUALIZE (RESET)



AUTO-EQUALIZE CONTROL	SD-4843-826
LORAIN PRODUCTS CORPORATION	SHEET 2

COMPONENT LIST

DIODES

	DESIG	CODE
(5)	CR1-5	(2811-101) IN4148
(6)	CR6-11	(2812-310) IN4818

DIODES, LIGHT EMITTING

	DESIG	CODE
(4)	DS-4	(2818-121) RED
	DS5	(2818-131) YELLOW

RELAY

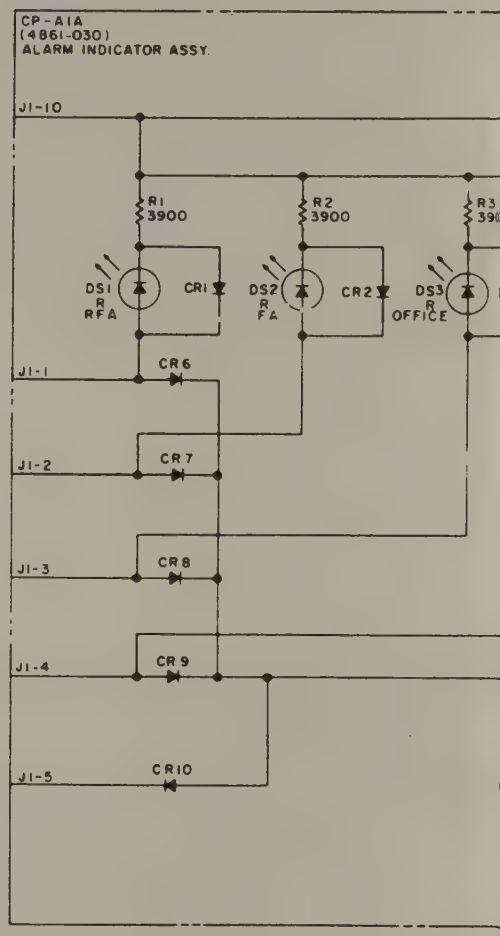
DESIG	CODE
K1	(2543-315) 24VDC, 590 OHMS

RESISTORS

	DESIG	CODE
(5)	R1-5	(2651-205) 3.9K, 3W
	R6	(2635-641) 2210 OHMS, 1W
	R7	(2651-180) 620 OHMS, 3W

SWITCH

DESIG	CODE
S1	(2513-603) 1PDT



CIRCUIT DESCRIPTION AND INPUT OUTPUT INFORMATION

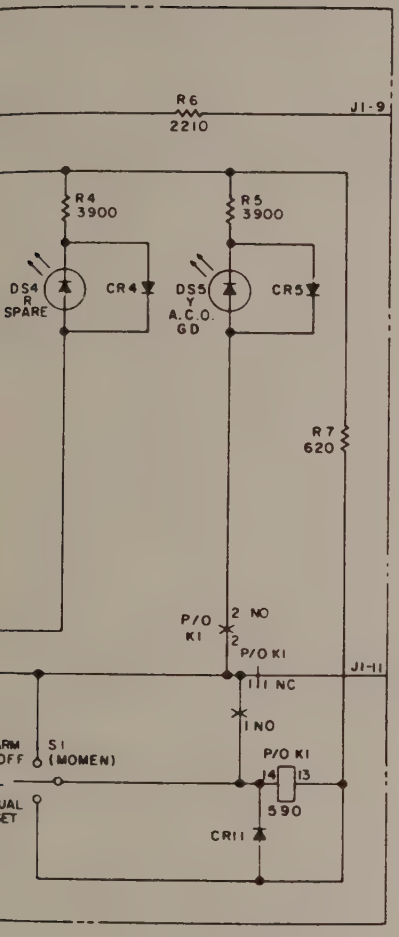
A GROUND FED ALARM SIGNAL AT J1-1 THROUGH J1-4 WILL PRODUCE A GROUND AT J1-11 AND LIGHT AN ASSOCIATED LED. THE GROUND SIGNAL AT J1-11 MAY BE USED TO ACTUATE AN AUDIBLE ALARM. IF IT IS DESIRED TO CUTOFF THE AUDIBLE ALARM, PLACING SWITCH S1 MOMENTARILY INTO THE ALARM CUTOFF POSITION WILL ENERGIZE RELAY K1 AND REMOVE GROUND FROM J1-11. AN ALARM CUTOFF GUARD LED WILL LIGHT. THE AUDIBLE ALARM MAY BE RECONNECTED BY PLACING S1 INTO THE MANUAL RESET POSITION. WHEN THE ALARM GROUND IS REMOVED, THE K1 RELAY WILL BE DEENERGIZED REGARDLESS OF ITS PREVIOUS STATE AND THE CIRCUIT WILL BE READY FOR THE NEXT ALARM CONDITION.

DIODE CR10 IS PROVIDED TO EXTEND ANY OF THE GROUND ALARM SIGNALS AT J1-5.

NEGATIVE BATTERY FUSED AT 1/2 AMP IS REQUIRED AT J1-10. NEGATIVE SUPPLY VOLTAGE FOR AN AUDIBLE ALARM IS MADE AVAILABLE THROUGH R6 AT J1-9.

MANUFACTURING REFERENCES	
CATEGORY	NUMBER
ASSEMBLY DRAWING	4861-030
P.W. BOARD	3155-637
CONNECTOR ON FRAME	2478-558

1	NEW	



SYMBOL
SHOWN IN DETAIL ON F.S

NOTES

1. UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICRO-FARADS VALUES PRECEDED BY THE SYMBOL + (PLUS) OR −(MINUS) ARE IN VOLTS
2. CODES IN PARENTHESES, AS (2811-101) REPRESENT L P C PART NUMBERS

184-6390	DESIGN: B BARNES	ECS 1
	DRAWN BY: J TUTTLE	DATE 11-30-79
	CHECKED BY: [illegible]	DATE 12-6-79
	CHECKED BY	DATE
	APPROVED BY: B Barnes	DATE 2/29/80
	RATING: STANDARD	
SCHEMATIC DIAGRAM FOR ALARM INDICATOR ASSEMBLY		SD 4861-030
LORAIN PRODUCTS CORPORATION LORAIN, OHIO	DWG SIZE D	SHEET 1 OF 1

PRINTED IN U.S.A.

COMPONENT LIST

DIODE

	DESIG	CODE
(2)	CR1A,1B	(2836-212) 12V, 1W, ZENER
	CR2	(2835-481) 8.2V, 0.4W, ZENER
(2)	CR3, 4	(2812-310)

RELAY

DESIG	CODE
K	(2543-422)

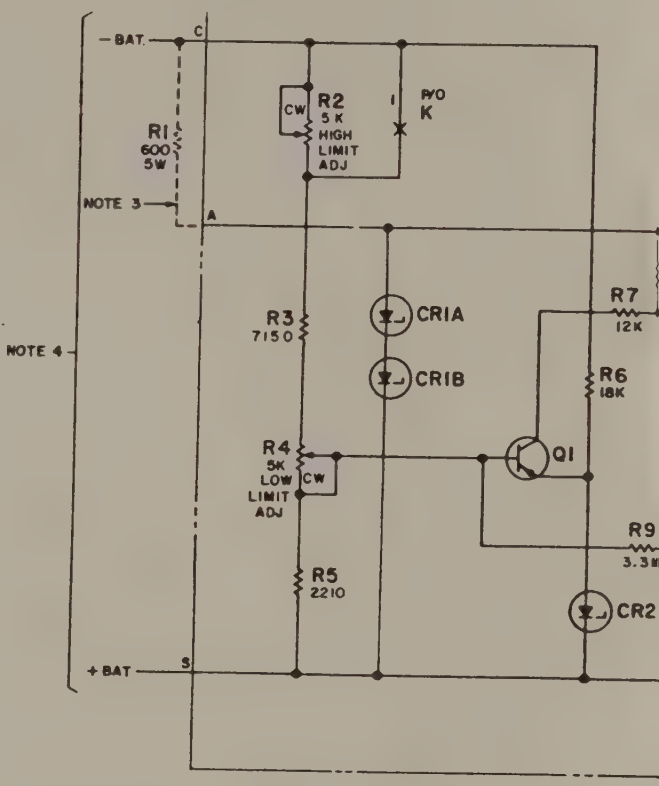
RESISTOR

	DESIG	CODE
(2)	R2, 4	(2633-076) 5K POTENTIOMETER
	R3	(2635-356) 7150 OHM, 1W, ±1%
	R5	(2635-641) 2210 OHM, 1W, ±1%
	R6	(2615-293) 18K, 1/2W
	R7	(2615-289) 12K, 1/2W
	R8	(2615-271) 2200 OHM, 1/2W
	R9	(2615-347) 3.3 MEGO, 1/2W
	R10	(2615-287) 10K, 1/2W
	R11	(2615-267) 1500 OHM, 1/2W
	R12	(2615-295) 22K, 1/2W

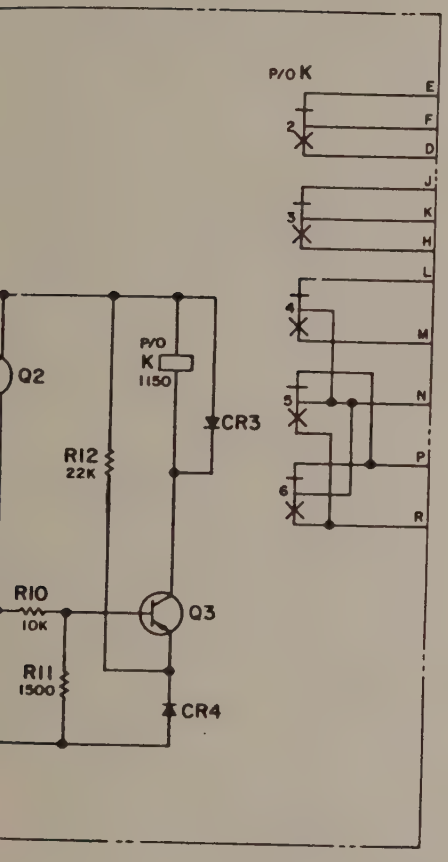
TRANSISTOR

	DESIG	CODE
(2)	Q1, 3	(2843-151)
	Q2	(2841-155)

CP-VCR
(4863-024)
VOLTAGE CONTROL RELAY



CR
NTROL



MANUFACTURING REFERENCES

CATEGORY	NUMBER
ASSEMBLY DRAWING	4863-024
P.W. BOARD	3157-113
CONNECTOR ON FRAME	3876-319 OR 4233-370

SYMBOL

SHOWN IN DETAIL IN FS

NOTES:

1. UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS AND CAPACITANCE VALUES ARE IN MICROFARADS.
2. CODES WITHIN PARENTHESES AS (2836-212) REPRESENT LPC PART NUMBERS.
3. ITEMS SHOWN WITH DOTTED LINES ARE NOT SUPPLIED AS PART OF THIS ASSEMBLY.
4. PROVIDE 1/3 AMP FUSE IN EITHER -BAT. LEAD FOR POSITIVE GROUND SYSTEMS OR + BAT. LEAD FOR NEGATIVE GROUND SYSTEMS.
5. POLARIZING NOTCH ON B .

REVISION	
5	1833821A1 REDRAWN. WAS SD-1866-02 ISS 4
6	183-6929 9-27-79 CR3 & CR4 WERE 2811-204, Q1 WAS 2847-098, Q2 WAS 2841-098, Q3 WAS 2847-100, R2 WAS 2683-072, & R3 WAS 2635-671.

VOLTAGE CONTROL RELAY
FOR 48 VOLT POWER BOARD
TWO LIMITS (OVERLAP)
CONTROL FUNCTION

LORAIN PRODUCTS CORPORATION
LORAIN OHIO

DWG SIZE D

DESIGN ISS 6
DRAWN BY DWG DATE 5-25-65
CHECKED BY D. GURNACK DATE 5-26-65
APPROVED BY DATE
APPROVED BY G. VASEK DATE 5-28-65
RATING STANDARD

SD-4863-024

SHEET 1 OF 1

TABLE A

SD-T DWG CROSS REFERENCE & FIGURE LOCATION TABLE

ITEMS IN PARENTHESES ARE FOR INFORMATION ONLY AND ARE NOT TO BE RECORDED ON JOB WIRING LIST DRAWING

LINE	SD-5821-052			T-5821-052				REMARKS
	SHEET	FIG	OPT	FIG	WRG	APP	SHEET	
1	2	1		1			2	
	2	2		2			2	
	3	13		3			2	
	2	4		4			2	
5	2,3	3,5-12		5			2	
10								
15								
20								
25								

TABLE B

RECORD OF FIGURES, APPARATUS AND WIRING CHANGES

CHANGED ON ISSUE	IF OFFICE RECORDS		THIS OPTION WAS FURNISHED	SEE ENG NOTE	RATING			
	SPECIFY	DO NOT SPECIFY			STD	A&M	MD	

TABLE D

CALCULATION OF VARIABLE LEAD SIZES

LEAD	LOOP DROP (VOLTS)	CALCULATE FOR
Ⓑ	1.0	MAX CHARGE CAPACITY OF PLANT
Ⓒ	1.0	RATED CHARGE CAPACITY OF RECTIFIER (NOTE 56)
Ⓓ	0.5	MAX DISCHARGE CAPACITY OF PLANT

TABLE C

FEATURE TABLE

ITEM	FEATURE	SPECIFY T-5821-052				SEE NOTE	REMARKS
		FIG	QUAN	WRG	APP		
1	RL TYPE RECTIFIER	1	AS REQD			56	
2	RHM TYPE RECTIFIER	2	AS REQD			56	
3	INVERTER	3	1				
4	-48V BATTERY	4					NOT PROVIDED FURN ON JOB BASIS
5	METER, CONTROL AND DISTRIBUTION	5	1				

BATTERY LEADS

CHARGE OR DISCHARGE CAPACITY OF PLANT, AMPERES	* LEAD SIZE Ⓑ, Ⓓ	MAX L BAT T Ⓑ
50	6	48'
	4	75'
	2	
	1/0	
75	4	
	2	
	1/0	
	2/0	
	3/0	
100	2	60'
	1/0	95'
	2/0	
	3/0	
	4/0	
150	1/0	64'
	2/0	80'
	3/0	
	4/0	
	250MCM	
	300MCM	
200	3/0	76'
	4/0	96'
	250MCM	
	300MCM	
	350MCM	
	400MCM	
230	4/0	
	250MCM	
	300MCM	
	350MCM	
	400MCM	
	500MCM	
300	350MCM	105'
400	(2) 3/0	76'
	(2) 4/0	95'
	(2) 250MCM	112'

ENGINEERING NOTES

51

THIS DRAWING AGREES WITH	ISSUE	1	2
SD-5821-052	ISSUE	1	1

52. EQUIPMENT ARRANGEMENT PER J-5821-052

53 A.C. SERVICE EQUIPMENT NOT PROVIDED; FURN AS REQD

54. DISTRIBUTION FUSES SHOWN ARE TYPICAL, QUANTITY AND CAPACITY SHALL BE FURN IN ACCORDANCE WITH JOB INFO

55 INSTRUCT INSTALLER TO CONNECT ALARM STRAPPING AS REQD PER JOB CONDITION

56. SEE ASSOCIATED POWER DATA SHEET OR 48 VOLT RECTIFIER DWG 0311-916 FOR REQD TERMINATIONS, WIRE AND FUSE SIZES FOR RECTIFIER MODEL BEING USED

MANUFACTURING NOTES

SHOP	INST		
X		1.	COLORED LEADS NOT OTHERWISE SPECIFIED TO BE 20 GA
X		2	BI-TERMINAL NEAREST PANEL
X	X	3	Ø - LEADS RUN BY INSTALLER
X		4.	⌀ - LEADS INSULATED WITH SLEEVING
X	X	5	DO NOT CUT CALIBRATED SHUNT LEADS. FOLD UP EXCESS AND TIE TO WIRE HARNESS
X	X	6.	LEADS SHOWN TERMINATED IN COMPONENTS WITHOUT TERMINALS ARE FURNISHED WITH COMPONENTS
X		7	D-WIRING NOT INCLUDED IN LOCAL WIRE HARNESS BUT RUN AS SEPARATE LEADS
X	X	8	Δ - LEADS RUN BY SHOP WHEN ASSOCIATED EQUIPMENT IS SHOP MOUNTED IN SAME BAY, OTHERWISE RUN BY INSTALLER.
X	X	9.	SEE J-5821-052 AND ASSOCIATED ASSEMBLY DRAWINGS FOR PART NUMBERS
X	X	10.	TERMINAL ON CARD RECEPTACLE SHOWN SOLID DENOTES LOCATION OF POLARIZING KEY
X	X	11.	CONNECT THIS LEAD TO TB1 TERMINAL 5 FOR USE WITH MODEL RHM200050 SPEC. NUMBER 5472-014; OTHERWISE CONNECT TO TB1 TERMINAL 7.
X	X	12.	INVERTER FAIL ALARM IS INDICATED BY A CLOSED CIRCUIT BETWEEN TERMINAL 2 AND 3 AND AN OPEN CIRCUIT BETWEEN TERMINAL 1 AND 2 OF TB1.
X	X	13.	RECTIFIER FAIL ALARM IS INDICATED BY A CLOSED CIRCUIT BETWEEN TERMINAL 4 AND 5 AND AN OPEN CIRCUIT BETWEEN TERMINAL 5 AND 6 OF TB1.
X	X	14.	FUSE FAIL ALARM IS INDICATED BY A CLOSED CIRCUIT BETWEEN TERMINAL 7 AND 8 AND AND OPEN CIRCUIT BETWEEN TERMINAL 8 AND 9 OF TB1.
X		15.	Ⓒ LEADS TO BE 8GA FOR WAA501B AND 6GA FOR WAA102B AND WAA202B.

1	BP	MAY 3 1982	M

AUTO EQUALIZE WIRING CORRECTED
NOTE 56 ADDED BP NOV 16 1982

2 1837844 D Burrough 11-16-82 M 11-12-82 D.A.C.

1846736

ISSUE 2

POWER SYSTEMS

CHARGE AND DISCHARGE CIRCUIT
50-300 AMP, -48 VOLT

MODEL 200CBX

DRAWN BY R. HONEY	DATE 4-14-82
CHECKED BY P Boston	DATE 4-27-82
APPROVED BY	DATE
APPROVED BY D Burrough	DATE 4-29-82
RATING	STANDARD
	T-5821-052

LORAIN PRODUCTS CORPORATION
LORAIN, OHIO
LORAIN PRODUCTS (CANADA) LTD., ST THOMAS, ONTARIO

DWG SIZE D

2 SHEETS

SHEET 1

PRINTED IN U.S.A.

FIG 1
RL TYPE RECTIFIER

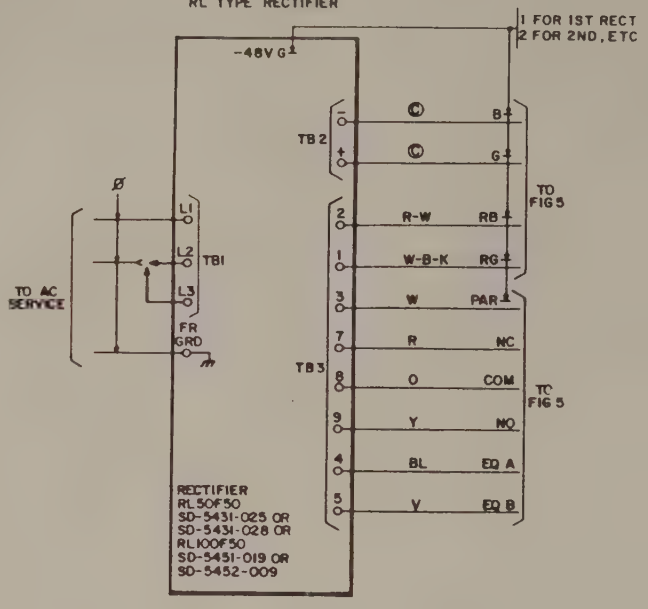


FIG 2
RHM TYPE RECTIFIER

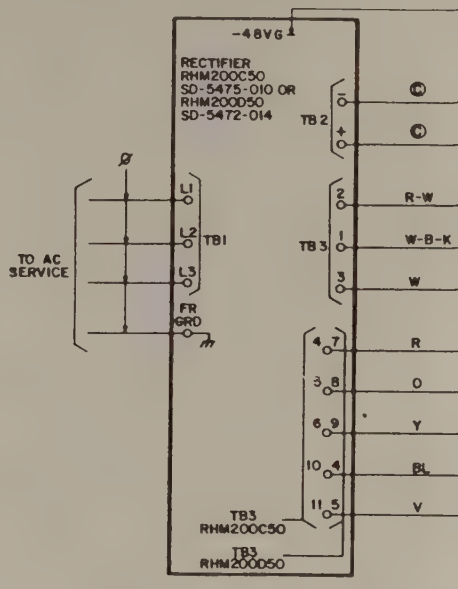


FIG 3
INVERTER

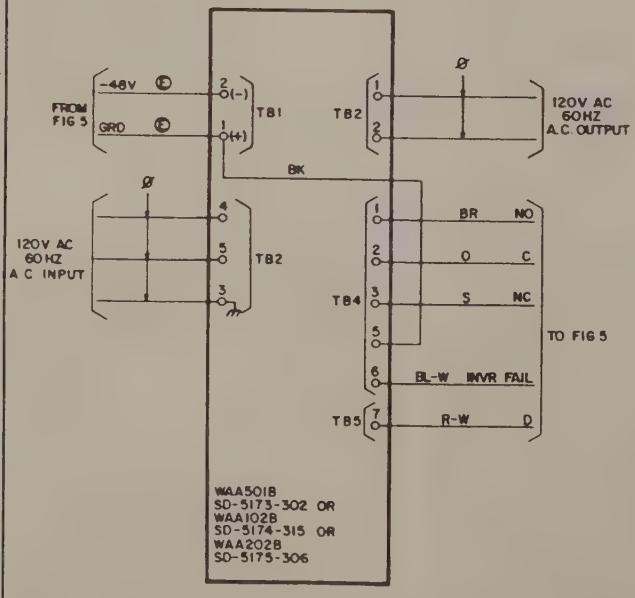


FIG 4
-48V BATTERY

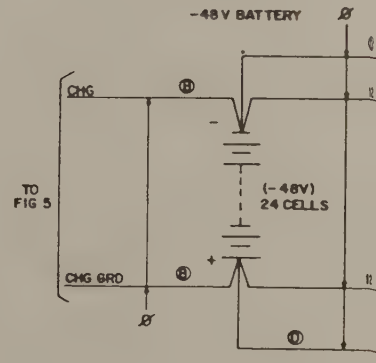
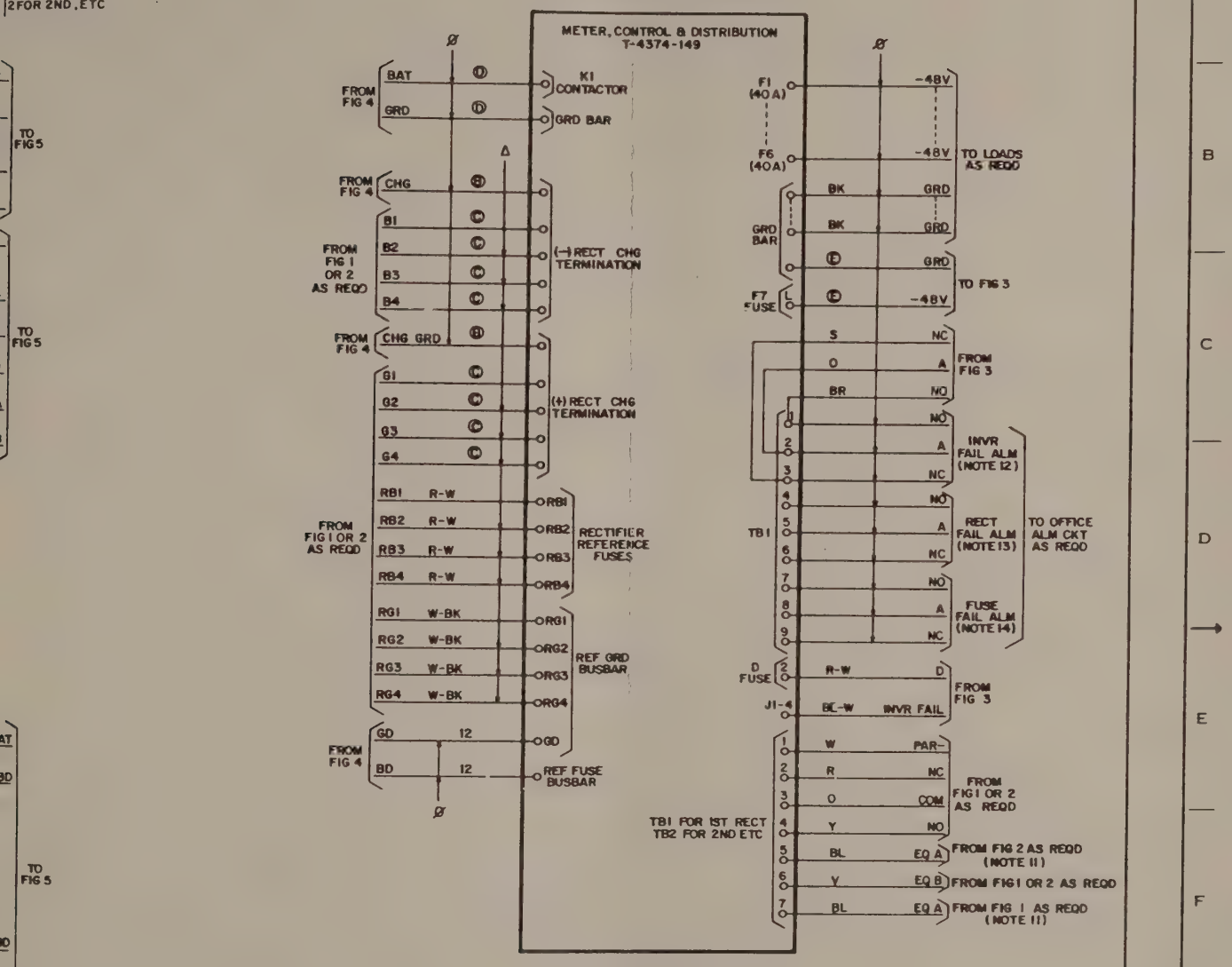


FIG 5

METER, CONTROL & DISTRIBUTION



1 FOR 1ST RECT
2 FOR 2ND, ETC

TO FIG 5

DRAWING ISSUE	
1	
2	

ISSUE 2

MODEL 200CBX

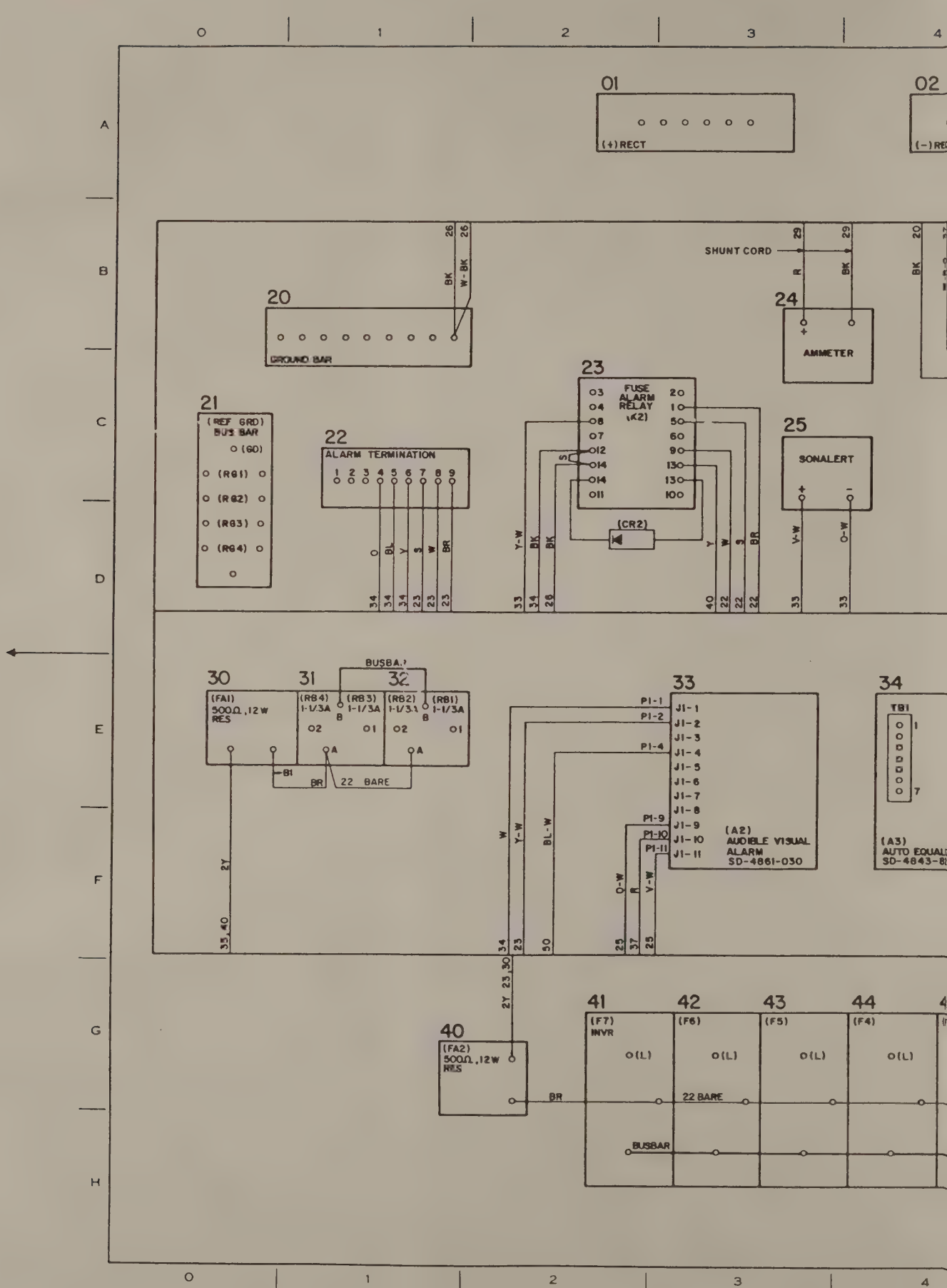
T-5821-052

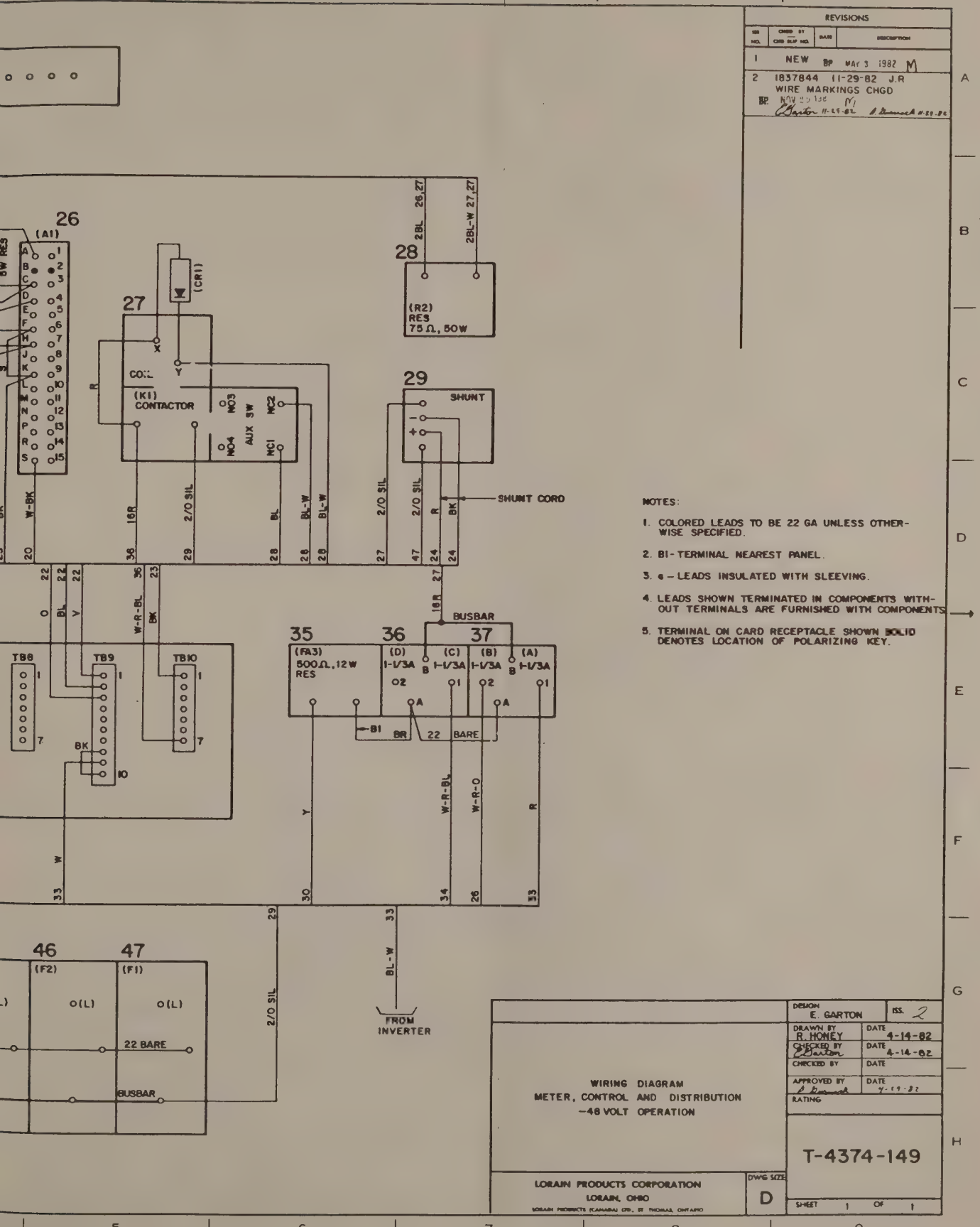
LORAIN PRODUCTS CORPORATION

DWG SIZE D

SHEET 2 OF 2

PRINTED IN U.S.A.


01
(+) RECT
02
(-) RE
20
GROUND BAR
BK
W-BK
26
SHUNT CORD
29
R
BK
24
AMMETER
23
FUSE
ALARM
RELAY
(K2)
03
04
08
07
012
014
014
011
20
10
50
60
90
130
130
100
(CR2)
25
SONALERT
21
(REF GRD)
BUS BAR
(G0)
(R81)
(R82)
(R83)
(R84)
22
ALARM TERMINATION
1 2 3 4 5 6 7 8 9
O
BL
Y
S
W
BR
34
34
34
23
23
23
Y-W
BK
BK
33
34
28
S
Y
W
S
BR
40
22
22
22
V-W
O-W
33
33
BUSBAR
30
(FA1)
500Ω, 12W
RES
31
(R84)
1-1/3A
(R83)
1-1/3A
32
(R82)
1-1/3A
(R81)
1-1/3A
B
B
02
01
02
01
A
A
B1
BR
22 BARE
2Y
35,40
33
P1-1
P1-2
P1-4
P1-9
P1-10
P1-11
J1-1
J1-2
J1-3
J1-4
J1-5
J1-6
J1-7
J1-8
J1-9
J1-10
J1-11
(A2)
AUDIBLE VISUAL
ALARM
SD-4861-030
W
Y-W
BL-W
O-W
R
Y-W
34
23
50
25
37
25
34
TB1
1
7
(A3)
AUTO EQUALI
SD-4843-8
2Y 23,30
40
(FA2)
500Ω, 12W
RES
BR
41
(F7)
INVR
42
(F6)
43
(F5)
44
(F4)
O(L)
O(L)
O(L)
O(L)
22 BARE
BUSBAR



DESIGN	E. GARTON
DRAWN BY	R. HONEY
DATE	4-14-82
CHECKED BY	E. Garton
DATE	4-14-82
CHECKED BY	
DATE	
APPROVED BY	A. Bennett
DATE	4-29-82
RATING	

WIRING DIAGRAM
METER, CONTROL AND DISTRIBUTION
-48 VOLT OPERATION

T-4374-149

LORAIN PRODUCTS CORPORATION
LORAIN, OHIO

DWG SIZE D

SHEET 1 OF 1

TABLE A

RECTIFIER SPECIFICATIONS

SEE FIG	SEE NOTE	MODEL SPEC	A.C. INPUT VOLTS	A.C. INPUT RECM FUSING AMPS	A.C. INPUT RECM WIRE SIZE	FRAME GRD RECM WIRE SIZE	D.C. OUTPUT VOLTS	D.C. OUTPUT AMPS	© RECM OUTPUT LEAD SIZE FOR 10 VOLT LOOP DROP 14	12	10	8	6	4	2	1/0	2/0
1U	7	RJ6A50 5351-008	120	15	14	14	50	6	60'	97'	155'						
1A		L6A50 5351-006	120	15	14	14	50	6	60'	97'	155'						
1A		M6F50 5351-003	120 240	15 (2) 15	14	14	50	6	60'	97'	155'						
1V	5,6	RJ6F50 5351-009	120 240	15 (2) 15	14	14	50	6	60'	97	155'						
1A		L12A50 5371-013	120	15	14	14	50	12		49'	78'	124'					
1A		M12F50 5371-005	120 240	15 (2) 15	14	14	50	12		49'	78'	124'					
1U	7	RJ12A50 5371-016	120	15	14	14	50	12	30'	49'	78'	124'					
1V	5,6	RJ12F50 5371-017	120 240	15 (2) 15	14	14	50	12	30'	49'	78'	124'					
1A		M18F50 5371-006	120 240	30 (2) 15	10 14	10 14	50	18			52'	83'	132'				
1Z	6	RJ20F50 5371-020	120 240	20 (2) 15	12 14	12 14	50	20		29'	47'	75'	118'				
1B		M25F50 5411-033	120 240	30 (2) 15	10 14	10 14	50	25				60'	95'	150'			
1C		HM25F50 5411-039	120 240	25 (2) 15	10 14	10 14	50	25				60'	95'	150'			
1W	4	RL30F5 5411-044	120 240	25 (2) 15	10 14	10 14	50	30				50'	79'	125'			
1T	5	RL30F50 5411-045	120 240	25 (2)15	10 14	10 14	50	30				50'	79'	125'			
1B		L30F50 5411-037	120 240	30 (2) 15	10 14	10 14	50	30				50'	79'	125'			
1B		M30F50 5411-025	120 240	40 (2) 20	8 12	10 12	50	30				50'	79'	125'			
1R	4	RL30F50 5411-043	120 240	25 (2) 15	12 14	10 14	50	30				50'	79'	125'			
1B		M37F50 5411-026	120 240	50 (2) 25	6 10	10	50	37					64'	102'	160'		
1T	5	RL50F50 5431-025	120 240	40 (2)25	8 10	10	50	50					47'	75'	120'		
1C		HM50F50 5431-019	120 240	50 (2) 25	6 10	10	50	50					47'	75'	120'		
1E		HM50050 5434-006	240	(3) 15	14	14	50	50					47'	75'	120'		
1B		L50F50 5431-018	120 240	50 (2) 25	6 10	10	50	50					47'	75'	120'		
1B		M50F50 5431-006	120 240	60 (2) 30	6 10	10	50	50					47'	75'	120'		
1D		M50050 5434-001	240	(3) 15	14	14	50	50					47'	75'	120'		
1R	4	RL50F50 5431-023	120 240	35 (2) 20	10 12	10 12	50	50					47'	75'	120'		
1W	4	RL50F50 5431-024	120 208 240	40 (2) 25 (2) 20	8 10 12	10 12	50	50					47'	75'	120'		
1F		M75D50 5444-003	240	(3) 25	10	10	50	75							80'	127'	
1B		M75F50 5441-001	120 240	100 (2) 50	2 6	8 10	50	75							80'	127'	
1C		HM100F50 5451-017	120 240	100 (2) 50	2 6	8 10	50	100							60'	95'	120'
1E		HM100D50 5454-006	240	(3) 30	10	10	50	100							60'	95'	120'
1B		L100F50 5452-004	120 240	100 (2) 50	2 6	8 10	50	100							60'	95'	120'
1B		M100F50 5451-001	120 240	100 (2) 50	2 6	8 10	50	100							60'	95'	120'
1F		M100D50 5454-003	240	(3) 35	8	10	50	100							60'	95'	120'
1Q		F100050	240	(3) 30	10	10	50	100							60'	95'	120'
1S		XS20493L21 5451-010	240	50 DUAL ELEMENT	6	10	50	100							60	95'	120'
1R	4	RL100F50 5451-018	120 240	70 (2) 40	6 8	8 10	50	100							60'	95'	120'
1J	5	RHM100D50 5454-009	240	(3) 30	10	10	50	100							60'	95'	120'
1J		RHM100D50 5454-008	240	(3) 30	10	10	50	100							60'	95'	120'
1T	5	RL100F50 5452-009	120 127 208 220-240	80 70 (2) 50 (2) 40	4 6 8	8	50	100							60'	95'	120'
1J	5	RHM100C50 5457-005	380 400 415	(3) 15	14	14	50	100							60'	95'	120'
1W	4	RL100F50 5451-019	120 208 240	80 (2) 50 (2) 40	4 6 8	8 10	50	100							60'	95'	120'
1Y		RHM100D50 5454-010	240	(3) 30	8	10	50	100							60'	95'	120'

SEE FIG	SEE NOTE	MODEL SPEC	A.C. INPUT VOLTS	A.C. INPUT RECM FUSING AMPS
1Y		RHM200D50 5472-014	240	(3) 60
1E		HM200D50 5472-009	240	(3) 50
1E		HM200E50 5475-008	480	(3) 30
1J		RHM200D50 5472-012	240	(3) 60
1F		M200D50 5472-003	240	(3) 60
1J	5	RHM200D50 5472-013	240	(3) 60
1Q		F200D50 5471-001	240	(3) 60
1J	5	RHM200C50 5475-010	380 400 415	(3) 30
1J		RHM400D50 5481-029	240	(3)125
1J	5	RHM400D50 5481-034	240	(3)125
1H		HM400D50 5481-018	240	(3)100
1N		HM400E50 5482-007	480	(3) 50
1J	5	RHM400C50 5482-017	380 400 415	(3)60
1K		M400D50 5481-009	240	(3)100
1Y		RHM400D50 5481-036	240	(3) 100
1Q		F400D50 5481-004	240	(3)100
1X		RL400D50 5481-035	240	(3)100
1H		HM800D50 5484-019	240	(3)200
1H		HM800E50 5485-013	480	(3)100
1J		RHM800D50 5484-030	240	(3)225
1L		M800D50 5484-008	240	(3)200
1P		M800E50 5485-006	480	(3)100
1M		HM1600D50 5487-006	240	(3)400
1N		HM1600E50 5487-207	480	(3)200

TABLE A

RECTIFIER SPECIFICATIONS

FRAME GRD RECM WIRE SIZE	D.C. OUTPUT VOLTS	D.C. OUTPUT AMPS	© 4/0	© 250 MCM			(2)250 MCM	600 MCM		(2)600 MCM			(4)600 MCM
			RECM OUTPUT LEAD SIZE FOR 1.0 VOLT LOOP DROP										
10	50	200	95'	112'									
10	50	200	95'	112'									
10	50	200	95'	112'									
10	50	200	95'	112'									
10	50	200	95'	112'									
10	50	200	95'	112'									
10	50	200	95'	112'									
10	50	200	95'	112									
6	50	400						135'					
6	50	400						135'					
8	50	400						135'					
10	50	400						135'					
10	50	400						135'					
8	50	400					112'						
8	50	400						135'					
8	50	400					112'						
8	50	400					112'	135'					
6	50	800								134'			
8	50	800								134'			
3	50	800								134'			
6	50	800								134'			
8	50	800								134'			
3	50	1600											134'
5	50	1600											134'

NOTES

1. RECTIFIER TERMINATIONS SHOWN ARE FOR USE WITH STANDARD POWER BOARD FEATURES. FOR OTHER AVAILABLE FUNCTIONS NOT SHOWN SEE RECTIFIER POWER DATA SHEET AND PROVIDE AS REQUIRED
2. ALL COLORED LEADS TO BE 18GA UNLESS OTHERWISE SPECIFIED.
3. WIRE SIZES MEET THOSE RECOMMENDED IN NATIONAL ELECTRIC CODE TABLE FOR NOT MORE THAN THREE COPPER CONDUCTORS IN RACEWAY FOR 75°C CONDUCTOR TEMP.
4. FOR THESE MODELS, 120 VOLT A.C. SERVICE IS CONNECTED TO T.B.1, TERMS L1 & L3; OR 208/240 VOLT TO L1 & L2
5. 50/60 HZ MODEL
6. FOR THESE MODELS, 120 VOLT A.C. SERVICE IS CONNECTED TO T.B.3, TERMS 1 & 3; OR 208/240 VOLT TO 1 & 2.
7. MODEL EQUIPPED WITH A.C. INPUT CORD.

REVISIONS

NO.	LTR	CHKD BY CHG. ELEC. ENG.	DATE	DESCRIPTION
1	M			
2		1836628	8-3-78	D.A.C. NEW MODELS, NOTE 5 ADDED
3	M	1836929	9-21-79	J.R. NEW MODELS, NOTES 6 & 7 ADDED

B. Barnard 8-16-78

BP SEP 27 1979

Ron Wang

B. Barnard 9-26-79

DESIGN	ISS 3
DRAWN BY L.L.D. Barnard	DATE 5-16-75
CHECKED BY Karl Kinsinger	DATE 8-27-76
APPROVED BY Richard Smith	DATE 8-30-76
APPROVED BY	DATE
RATING STANDARD	

POWER SYSTEMS

48 VOLT RECTIFIER CONNECTIONS & SPECIFICATIONS FOR USE WITH STANDARD POWER BOARD MODELS

0311-916

LORAIN PRODUCTS CORPORATION
LORAIN, OHIO
LORAIN PRODUCTS (CANADA) LTD. ST THOMAS, ONTARIO

DWG SIZE D

SHEET 1 OF 5

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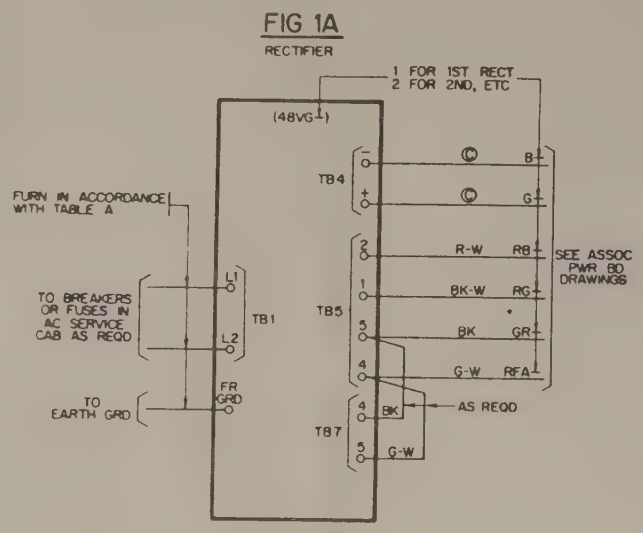


FIG 1A
RECTIFIER
1 FOR 1ST RECT
2 FOR 2ND, ETC
(48VG-1)
TB4
TB5
TB7
TB1
FURN IN ACCORDANCE WITH TABLE A
TO BREAKERS OR FUSES IN AC SERVICE CAB AS REQD
TO EARTH GRD
FR GRD
L1
L2
B
G
R-W
RB
BK-W
RG
BK
GR
G-W
RFA
SEE ASSOC PWR BD DRAWINGS
AS REQD

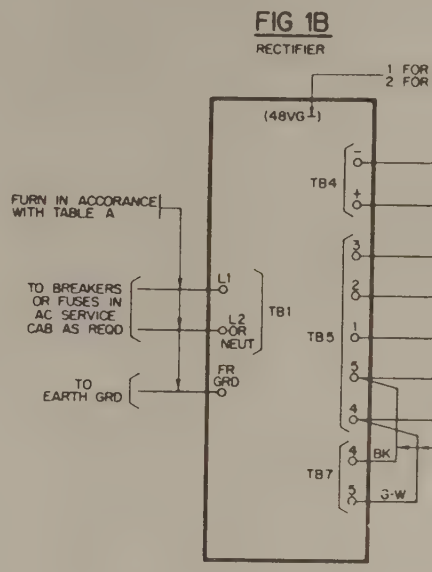


FIG 1B
RECTIFIER
(48VG-1)
TB4
TB5
TB7
TB1
FURN IN ACCORANCE WITH TABLE A
TO BREAKERS OR FUSES IN AC SERVICE CAB AS REQD
TO EARTH GRD
FR GRD
L1
L2 OR NEUT
BK
G-W

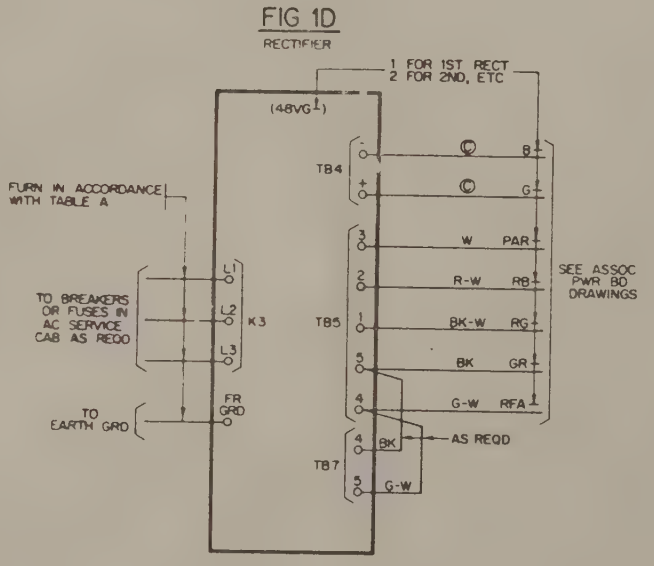


FIG 1D
RECTIFIER
1 FOR 1ST RECT
2 FOR 2ND, ETC
(48VG-1)
TB4
TB5
TB7
TB1
K3
FURN IN ACCORDANCE WITH TABLE A
TO BREAKERS OR FUSES IN AC SERVICE CAB AS REQD
TO EARTH GRD
FR GRD
L1
L2
L3
B
G
W
PAR
R-W
RB
BK-W
RG
BK
GR
G-W
RFA
SEE ASSOC PWR BD DRAWINGS
AS REQD

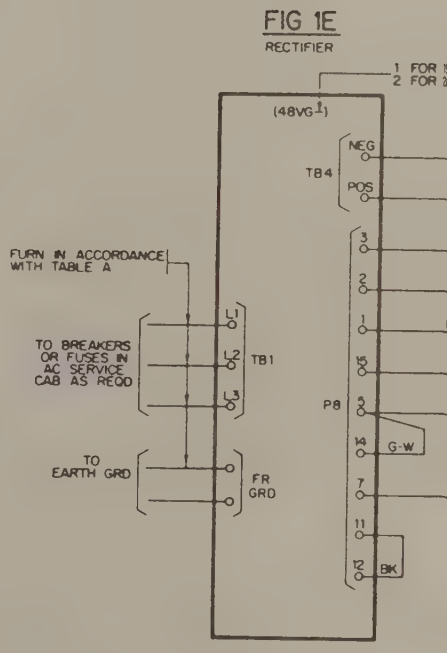


FIG 1E
RECTIFIER
(48VG-1)
TB4
NEG
POS
P8
TB1
FURN IN ACCORDANCE WITH TABLE A
TO BREAKERS OR FUSES IN AC SERVICE CAB AS REQD
TO EARTH GRD
FR GRD
L1
L2
L3
G-W
BK

DRAWING ISSUE
1 PB.
2 PB.
3 PB.
4m 10-9-79

30A

FIG 1C
RECTIFIER

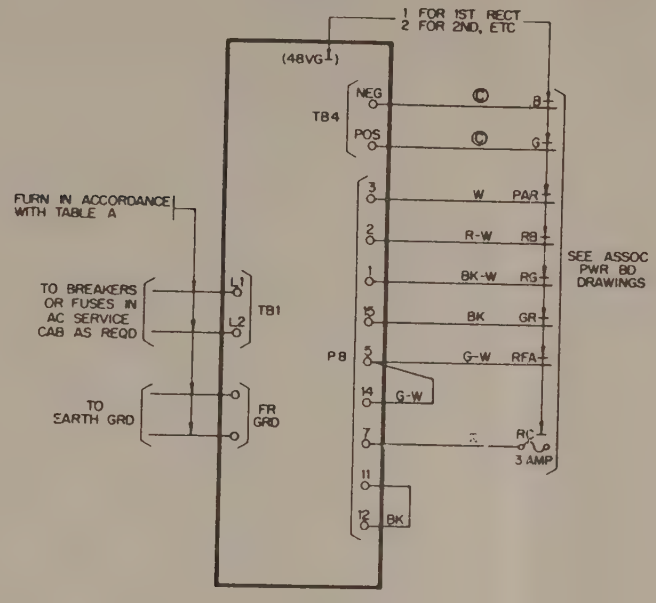
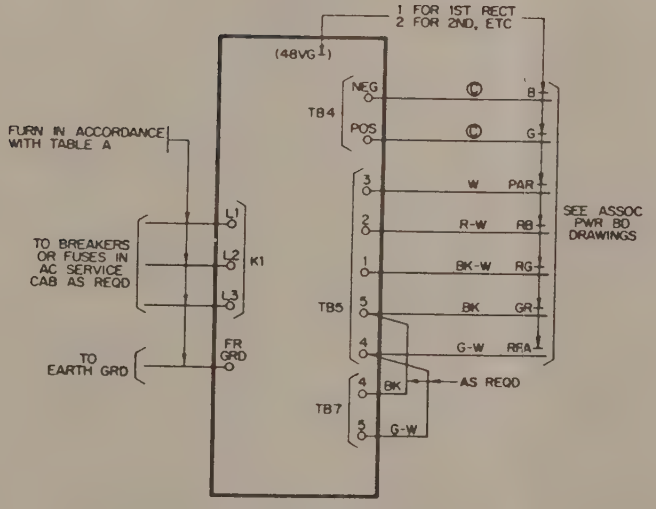


FIG 1F
RECTIFIER



ISSUE 3

48 VOLT RECTIFIER WIRING	0311-916
LORAIN PRODUCTS CORPORATION — DWG SIZE D	SHEET 2
PRINTED IN U.S.A.	

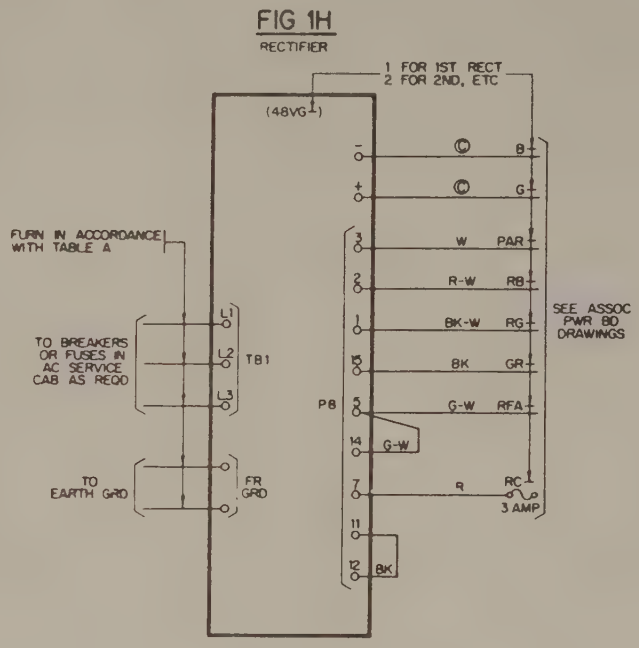


FIG 1H
RECTIFIER
1 FOR 1ST RECT
2 FOR 2ND, ETC
(48VG)
FURN IN ACCORDANCE WITH TABLE A
TO BREAKERS OR FUSES IN AC SERVICE CAB AS REQD
TB1
L1
L2
L3
TO EARTH GRD
FR GRD
P8
W PAR
R-W RB
BK-W RG
BK GR
G-W RFA
G-W
R RC
3 AMP
BK
SEE ASSOC PWR BD DRAWINGS

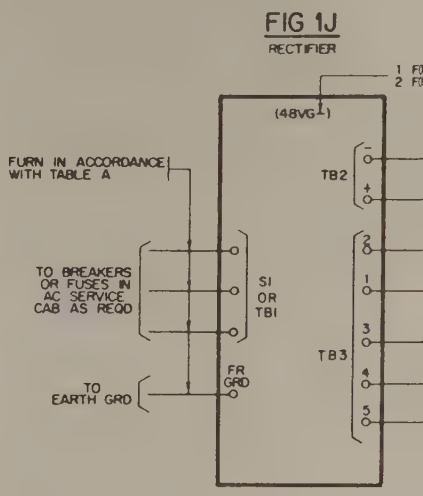


FIG 1J
RECTIFIER
(48VG)
FURN IN ACCORDANCE WITH TABLE A
TO BREAKERS OR FUSES IN AC SERVICE CAB AS REQD
S1 OR TB1
TO EARTH GRD
FR GRD
TB2
TB3

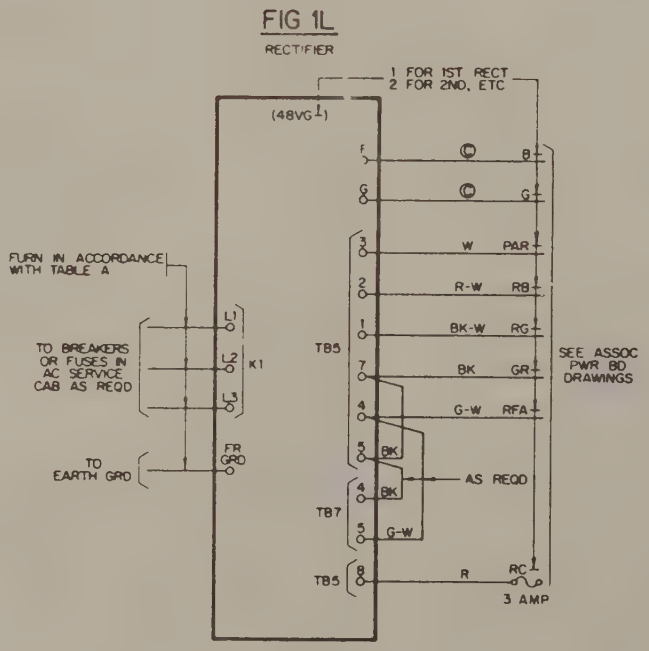


FIG 1L
RECTIFIER
1 FOR 1ST RECT
2 FOR 2ND, ETC
(48VG)
FURN IN ACCORDANCE WITH TABLE A
TO BREAKERS OR FUSES IN AC SERVICE CAB AS REQD
K1
TO EARTH GRD
FR GRD
TB5
W PAR
R-W RB
BK-W RG
BK GR
G-W RFA
BK
AS REQD
TB7
G-W
R RC
3 AMP
SEE ASSOC PWR BD DRAWINGS

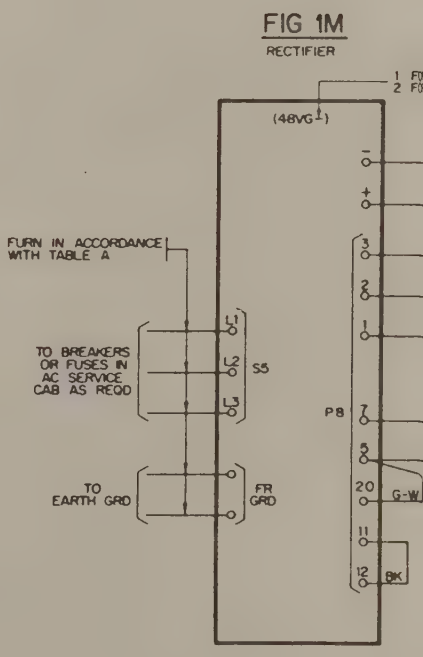


FIG 1M
RECTIFIER
(48VG)
FURN IN ACCORDANCE WITH TABLE A
TO BREAKERS OR FUSES IN AC SERVICE CAB AS REQD
S5
TO EARTH GRD
FR GRD
P8
G-W
BK

DRAWING ISSUE
1 08.
2 2/5/
3 M
RV 10-2-14

FIG 1K
RECTIFIER

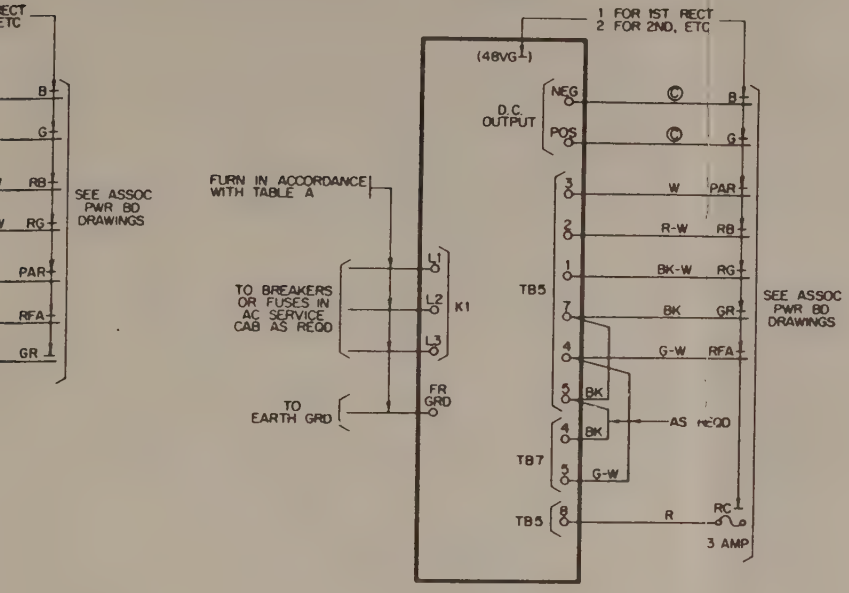
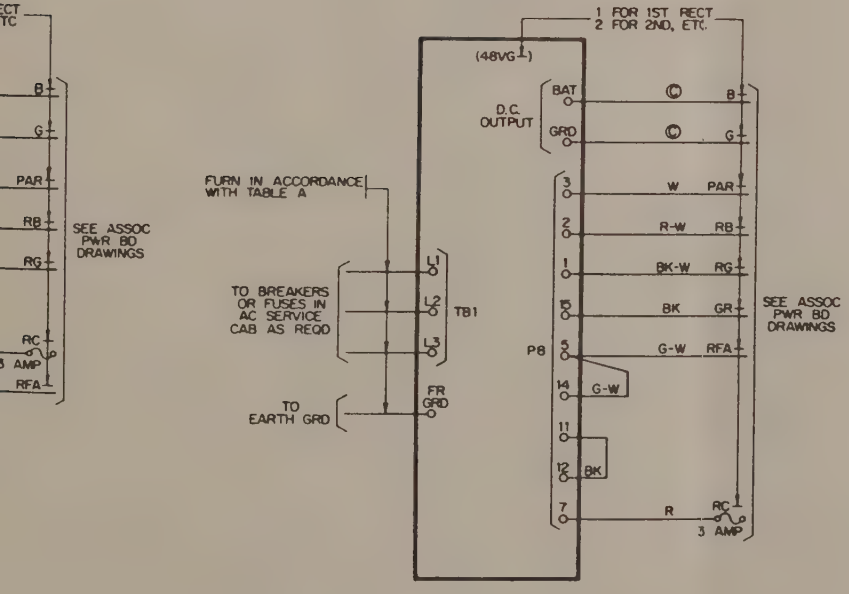


FIG 1N
RECTIFIER



ISSUE 3

48 VOLT RECTIFIER WIRING	0311-916
LORAIN PRODUCTS CORPORATION — DWG SIZE D	SHEET 3 — PRINTED IN U.S.A.

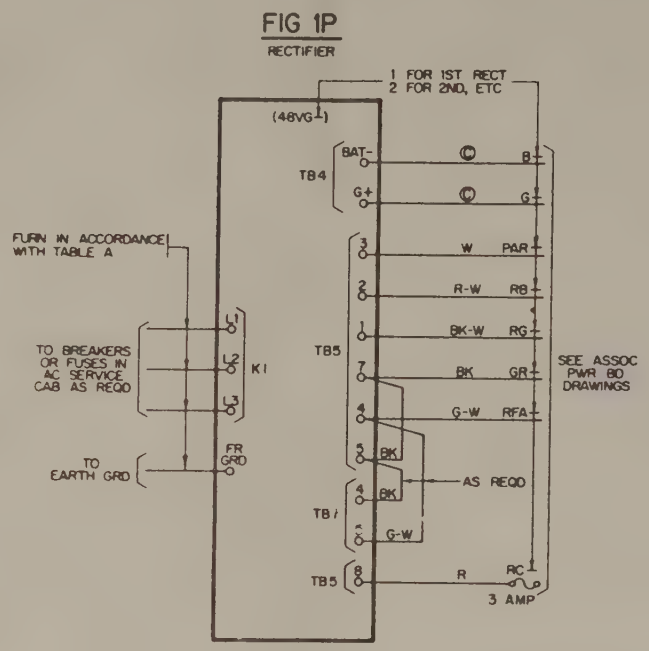


FIG 1P
RECTIFIER
1 FOR 1ST RECT
2 FOR 2ND, ETC
(48VG-)
TB4
BAT-
G+
B
G
W
PAR
R-W
RB
BK-W
RG
TB5
BK
GR
G-W
RFA
AS REQD
TB1
R
RC
3 AMP
SEE ASSOC PWR BD DRAWINGS
FURN IN ACCORDANCE WITH TABLE A
TO BREAKERS OR FUSES IN AC SERVICE CAB AS REQD
L1
L2
L3
K1
TO EARTH GRD
FR GRD

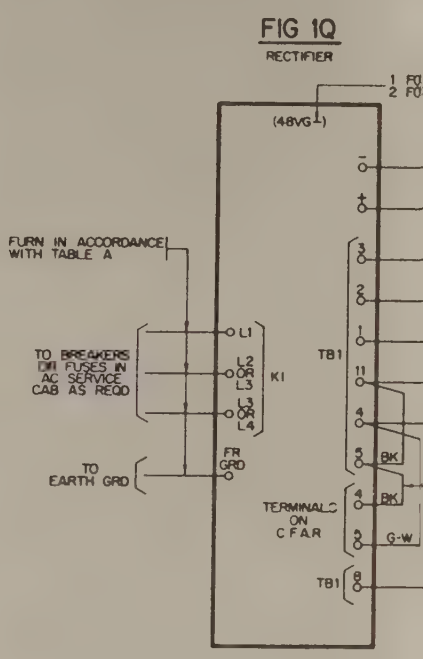


FIG 1Q
RECTIFIER
(48VG-)
FURN IN ACCORDANCE WITH TABLE A
TO BREAKERS OR FUSES IN AC SERVICE CAB AS REQD
L1
L2 OR L3
L3 OR L4
K1
TO EARTH GRD
FR GRD
TB1
BK
G-W
TERMINALS ON CFAR

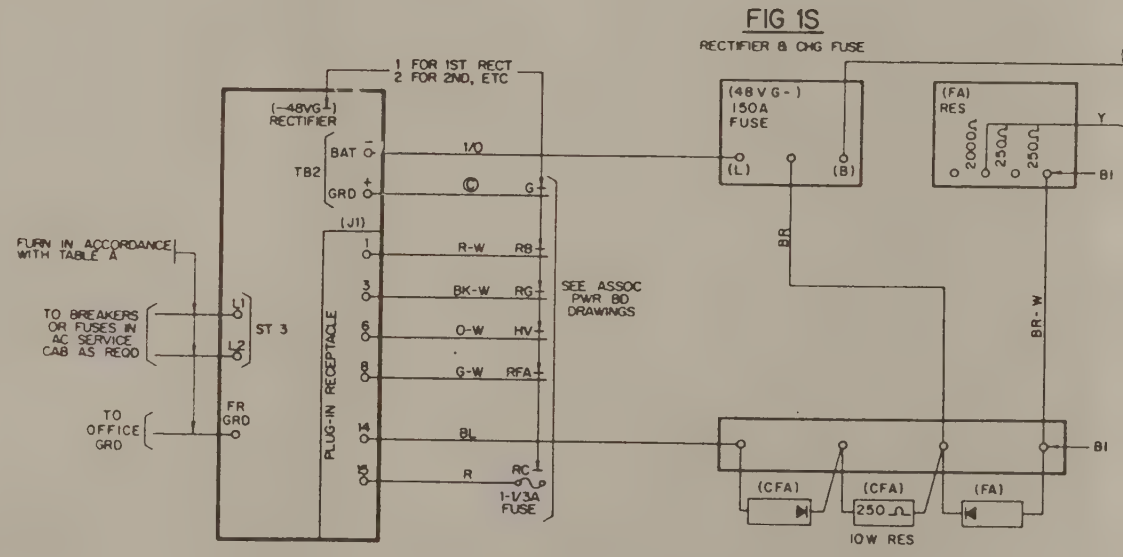


FIG 1S
RECTIFIER & CHG FUSE
1 FOR 1ST RECT
2 FOR 2ND, ETC
(-48VG-)
RECTIFIER
TB2
BAT -
GRD +
(J1)
PLUG-IN RECEPTACLE
1/O
G
R-W
RB
BK-W
RG
O-W
HV
G-W
RFA
BL
R
RC
1-1/3A FUSE
SEE ASSOC PWR BD DRAWINGS
FURN IN ACCORDANCE WITH TABLE A
TO BREAKERS OR FUSES IN AC SERVICE CAB AS REQD
L1
L2
ST 3
TO OFFICE GRD
FR GRD
(48VG-) 150A FUSE
(L)
(B)
(FA) RES
2000Ω
250Ω
250Ω
Y
BI
BR
BR-W
(CFA)
(CFA)
(FA)
250Ω
10W RES

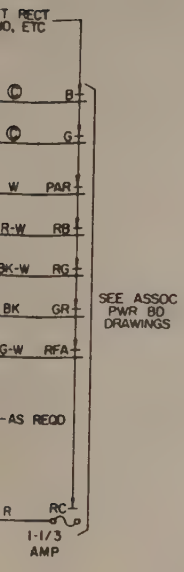
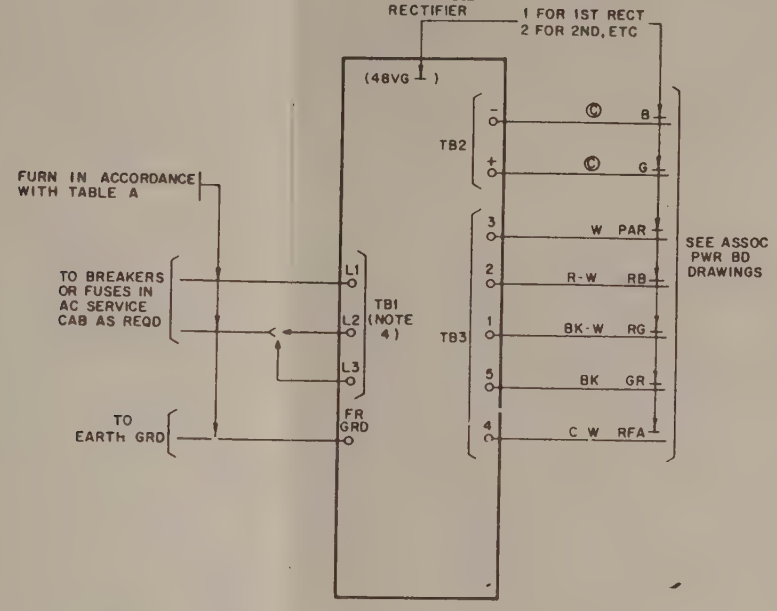


FIG 1R



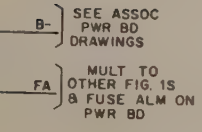
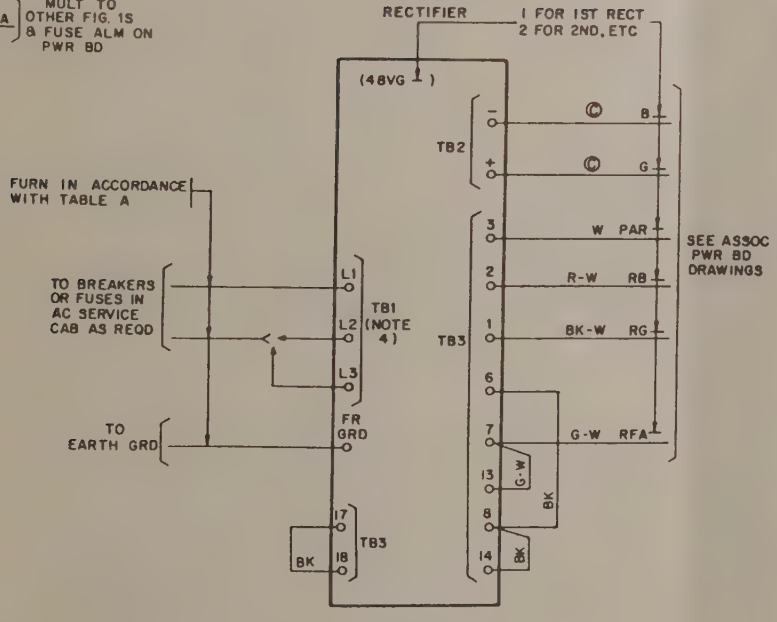


FIG 1T



48 VOLT RECTIFIER WIRING		0311-916
LORAIN PRODUCTS CORPORATION	DWG SIZE D	SHEET 4
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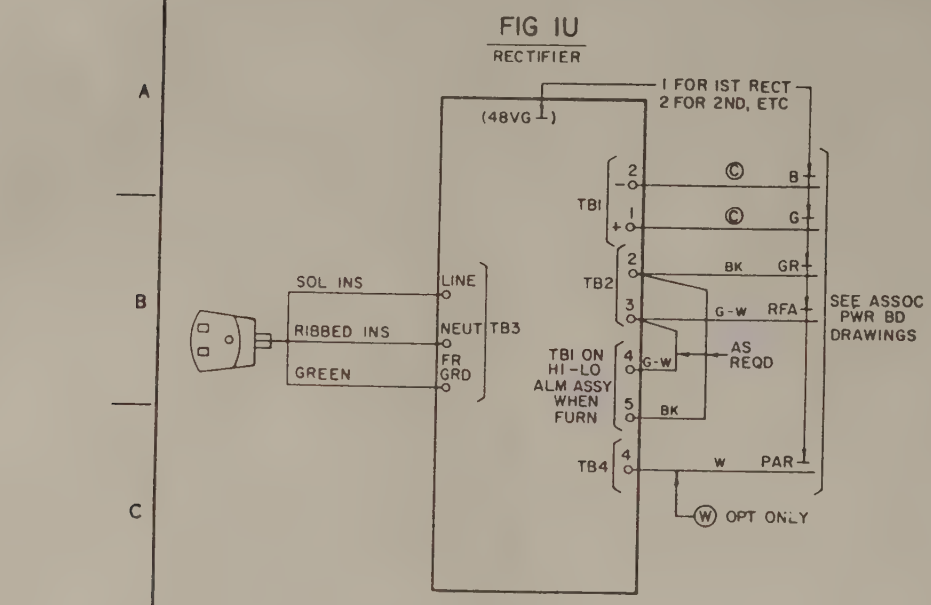


FIG IU
RECTIFIER
1 FOR IST RECT
2 FOR 2ND, ETC
(48VG)
TB1
TB2
TB3
TB4
SOL INS
RIBBED INS
GREEN
LINE
NEUT
FR GRD
BK
GR
G-W
RFA
W
PAR
B
G
SEE ASSOC PWR BD DRAWINGS
TB1 ON HI-LO ALM ASSY WHEN FURN
AS REQD
OPT ONLY

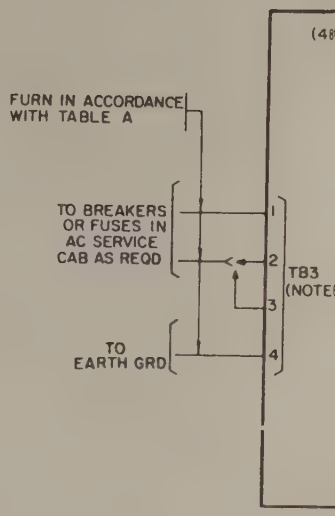


FIG
REC
(48
FURN IN ACCORDANCE WITH TABLE A
TO BREAKERS OR FUSES IN AC SERVICE CAB AS REQD
TO EARTH GRD
TB3
(NOTE

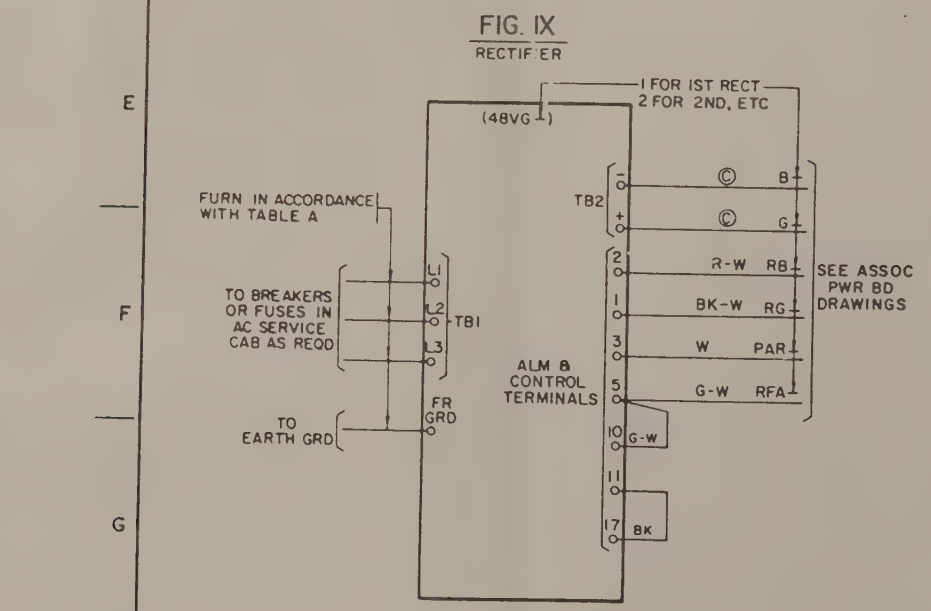


FIG. IX
RECTIFIER
1 FOR IST RECT
2 FOR 2ND, ETC
(48VG)
TB1
TB2
FURN IN ACCORDANCE WITH TABLE A
TO BREAKERS OR FUSES IN AC SERVICE CAB AS REQD
TO EARTH GRD
L1
L2
L3
FR GRD
R-W
RB
BK-W
RG
W
PAR
G-W
RFA
B
G
SEE ASSOC PWR BD DRAWINGS
ALM & CONTROL TERMINALS
BK

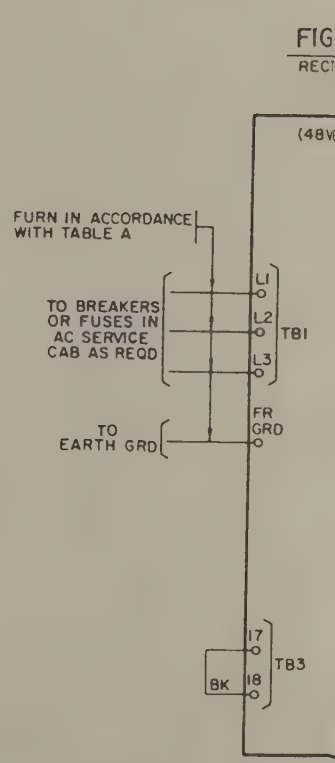


FIG
REC
(48V
FURN IN ACCORDANCE WITH TABLE A
TO BREAKERS OR FUSES IN AC SERVICE CAB AS REQD
TO EARTH GRD
L1
L2
L3
TB1
FR GRD
TB3
BK

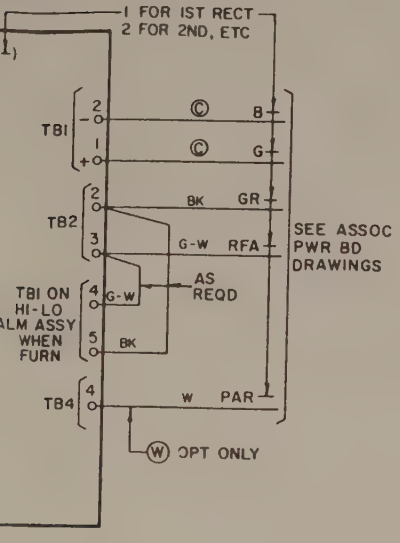
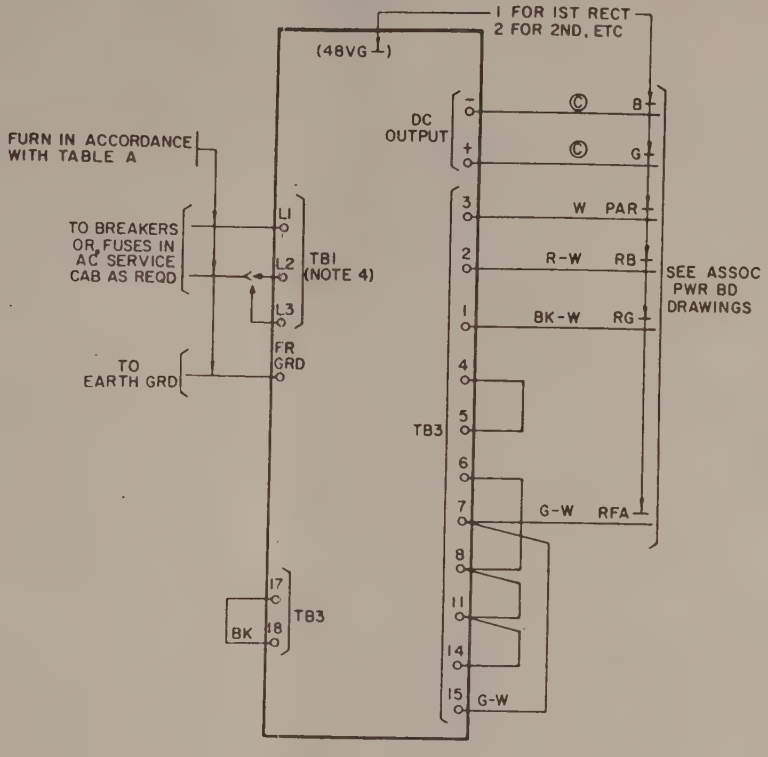


FIG 1W
RECTIFIER



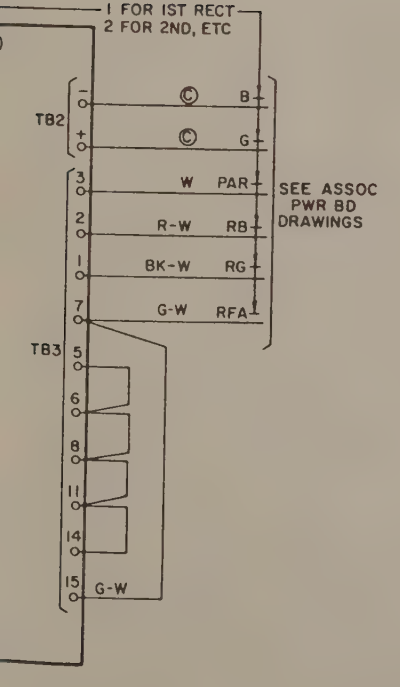
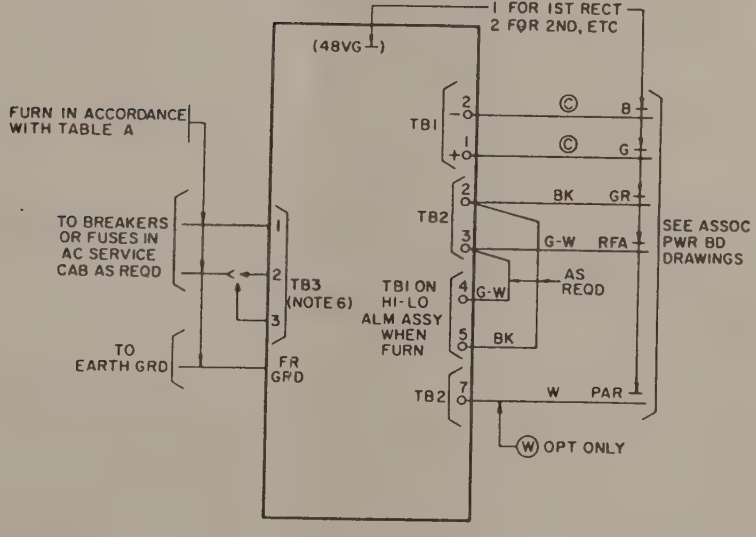


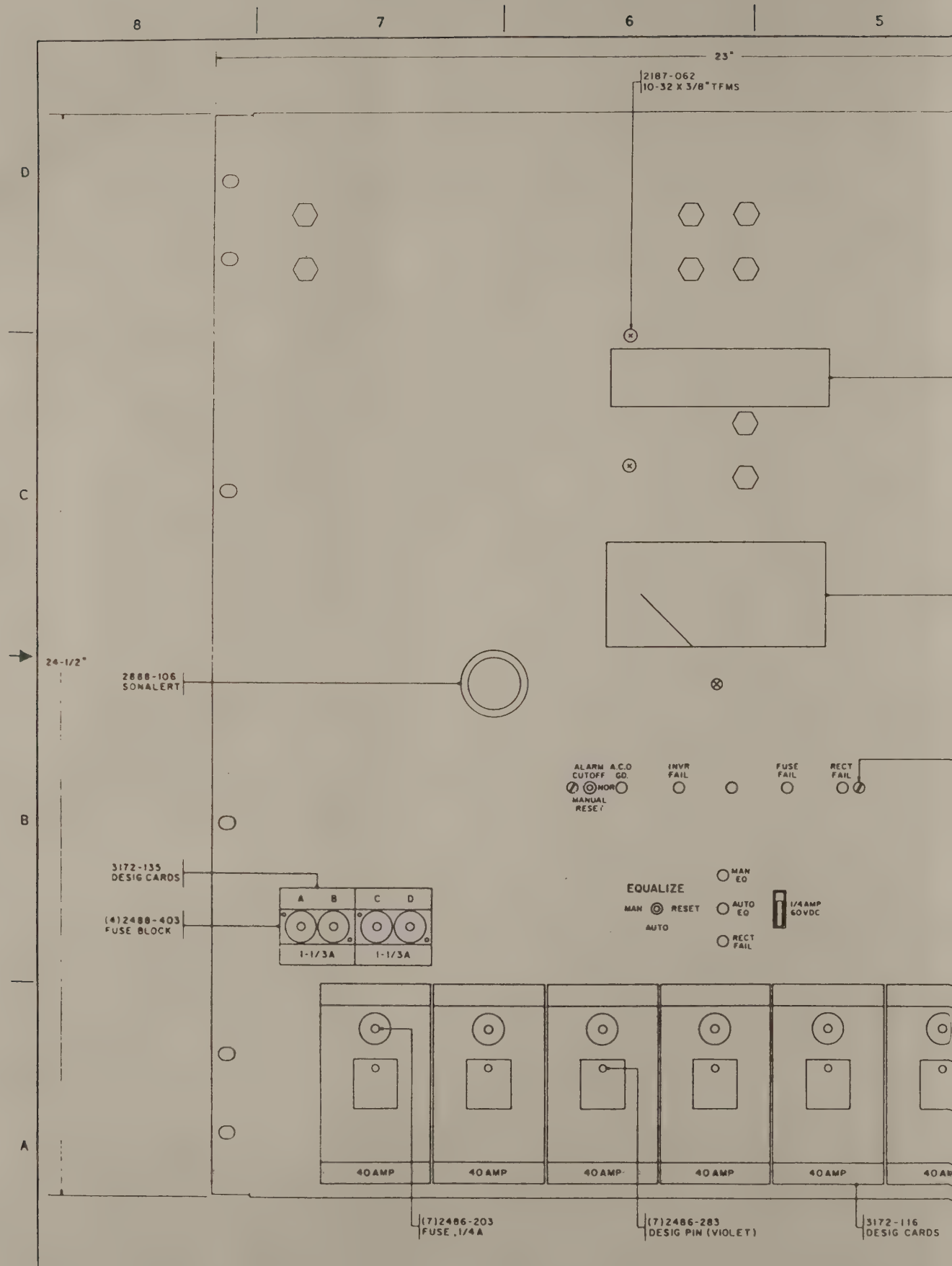
FIG 1Z
RECTIFIER

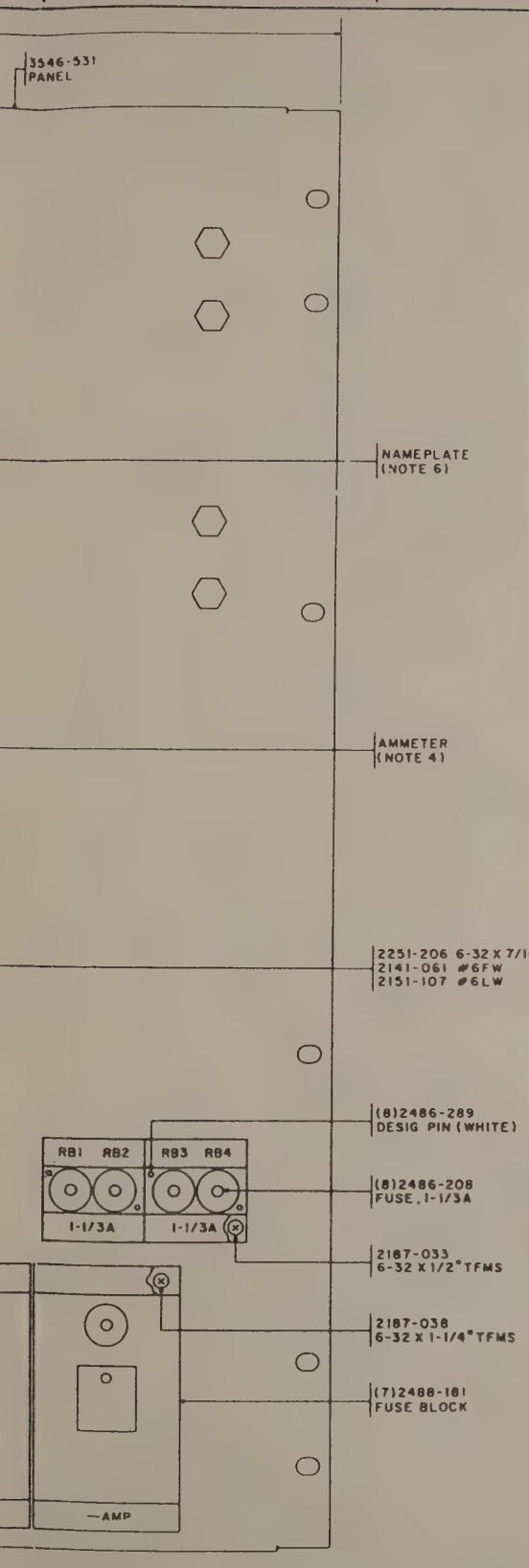


DRAWING ISSUE 3

ISSUE 3

48 VOLT RECTIFIER WIRING	0311-916
LORAIN PRODUCTS CORPORATION	SHEET 5
DWG SIZE D	PRINTED IN U.S.A.


8
7
6
5
23"
2187-062
10-32 X 3/8" TFMS
D
C
B
A
24-1/2"
2888-106
SONALERT
ALARM CUTOFF
A.C.O
GO
NOR
MANUAL RESET
INVR FAIL
FUSE FAIL
RECT FAIL
3172-135
DESIG CARDS
(4)2488-403
FUSE BLOCK
A
B
C
D
1-1/3A
1-1/3A
EQUALIZE
MAN
RESET
AUTO
MAN EQ
AUTO EQ
RECT FAIL
1/4AMP
60VDC
40AMP
40AMP
40AMP
40AMP
40AMP
(7)2486-203
FUSE .1/4A
(7)2486-283
DESIG PIN (VIOLET)
3172-116
DESIG CARDS



REVISIONS			
NO	CHG SLIP NO / CHG NO	DATE	DESCRIPTION
1	NEW	RP	MAY 3 [illegible]

NOTES:

1. STAMP ASSEMBLY NUMBER AND ISSUE NUMBER IN 3/16" BLACK CHARATERS
2. ALL STAMPING TO BE 3/16" BLACK CHARACTERS UNLESS OTHERWISE SPECIFIED.
3. DESIGNATIONS IN ( ) ARE SHOWN FOR REFERENCE ONLY
4. AMMETER AND SHUNT ARE FURNISHED WITH POWER BOARD ACCORDING TO CAPACITY REQUIRED.
5. CONNECT WIRE HARNESS 4946-011 PER T-4374-149.
6. NAMEPLATE IS FURNISHED WITH POWER BOARD AND TO BE MOUNTED ON THIS ASSEMBLY AS SHOWN.
7. DOTTED LUGS ARE FURNISHED WITH POWER BOARD ACCORDING TO CAPACITY OF PLANT AS SHOWN BELOW:
   LIST 1 AND 2 - 6-4/0 (2456-338)
   LIST 3 AND 4 - 1/0-500MCM (2456-346)

FIRST USED ON	NEXT ASSY	5821-052	SIZE
	MODEL NO	200CBX	D

LORAIN PRODUCTS CORPORATION
LORAIN, OHIO
A Subsidiary of Reliance Electric Co.

ASSEMBLY,
METER, CONTROL AND DISTRIBUTION
(24-1/2" X 23" R.R.MTG.)

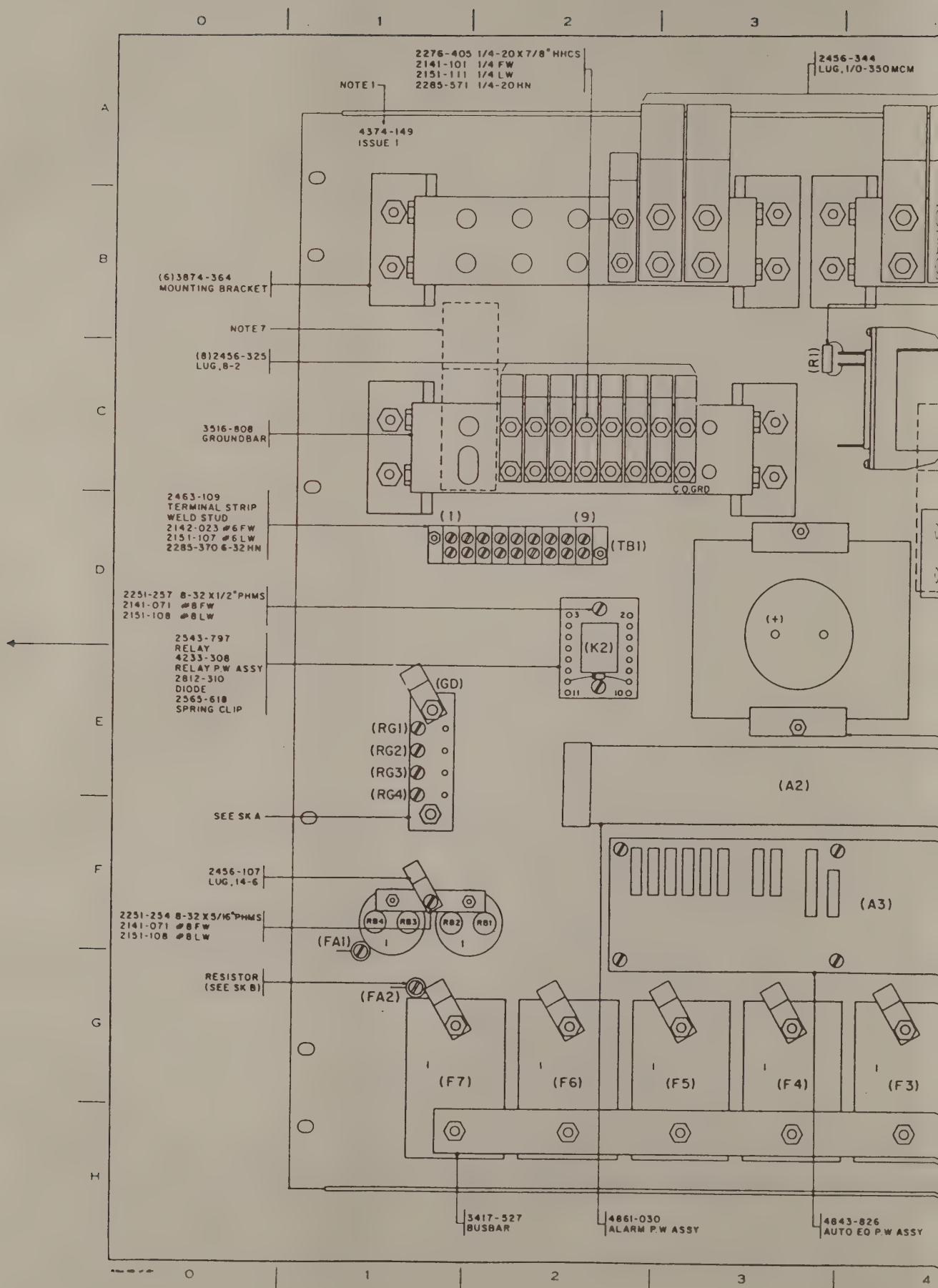
DRAWN	E GARTON	
CHECKED	R HONEY	4-15-82
ENGINEER	E Garton	4-16-82
APPROVED	E Linwood	4-17-82

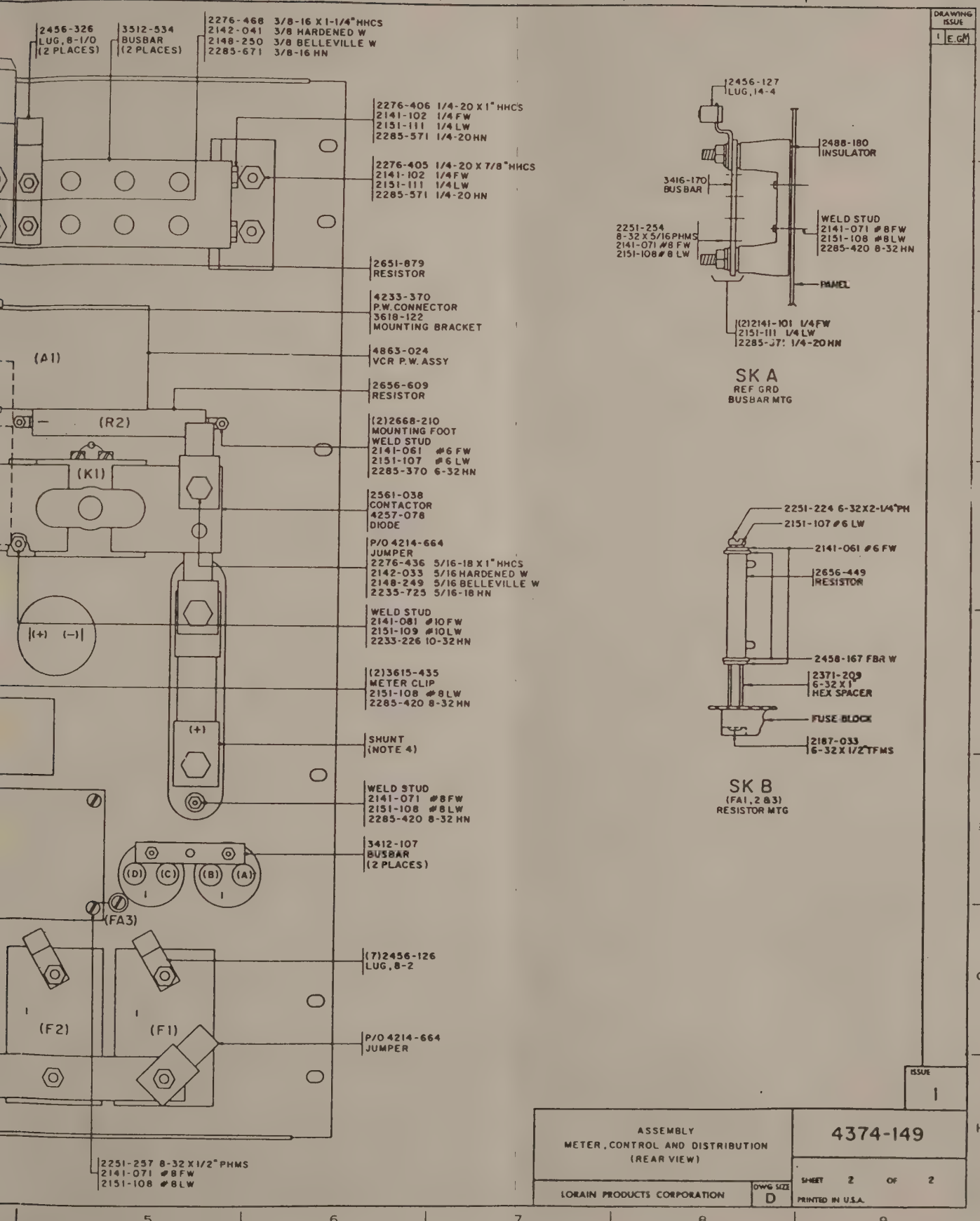
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS ±1/32 DECIMALS ±.01 ANGLES ±1°

DO NOT SCALE DWG

4374-149

SHEET 1 OF 2


2276-405 1/4-20X7/8" HHCS
2141-101 1/4 FW
2151-111 1/4 LW
2285-571 1/4-20HN
NOTE 1
4374-149
ISSUE 1
2456-344
LUG, 1/0-350MCM
(6)3874-364
MOUNTING BRACKET
NOTE 7
(8)2456-325
LUG, 8-2
3516-808
GROUNDBAR
C.O.GRD
(R1)
2463-109
TERMINAL STRIP
WELD STUD
2142-023 ø6FW
2151-107 ø6LW
2285-370 6-32HN
(1)
(9)
(TB1)
2251-257 8-32X1/2"PHMS
2141-071 ø8FW
2151-108 ø8LW
2543-797
RELAY
4233-308
RELAY P.W ASSY
2812-310
DIODE
2365-618
SPRING CLIP
(K2)
(+)
(GD)
(RG1)
(RG2)
(RG3)
(RG4)
SEE SK A
(A2)
(A3)
2456-107
LUG, 14-6
2251-254 8-32X5/16"PHMS
2141-071 ø8FW
2151-108 ø8LW
RB4
RB3
RB2
RB1
(FA1)
RESISTOR
(SEE SK B1)
(FA2)
(F7)
(F6)
(F5)
(F4)
(F3)
3417-527
BUSBAR
4861-030
ALARM P.W ASSY
4843-826
AUTO EQ P.W ASSY



SK A
REF GRD
BUSBAR MTG

SK B
(FA1, 2 B3)
RESISTOR MTG

DRAWING ISSUE
1 E.GM

ISSUE 1

ASSEMBLY
METER, CONTROL AND DISTRIBUTION
(REAR VIEW)

4374-149

LORAIN PRODUCTS CORPORATION

DWG SIZE D

SHEET 2 OF 2

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CONNECTICUT REGIONAL SERVICE CENTER
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East Windsor, Connecticut 06088
Telephone: 203/627-9378

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West Chicago, Illinois 60185
Telephone: 312/231-5775

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Norcross, Georgia 30093
Telephone: 404/449-0840

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Telephone: 817/640-1134

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Costa Mesa, California 92626
Telephone: 714/540-4395

NORTHERN CALIFORNIA REGIONAL SERVICE CENTER
473 Sapena, Bldg. 2, Suite 18
Santa Clara, California 95050
Telephone: 408/988-1078

CANADIAN SERVICE CENTER
122 Edward Street
St. Thomas, Ontario
Telephone: 519/631-0780

LORAIN SERVICE CAN ALSO PROVIDE:

Audio Visual Training Programs (Slide/Cassette)
- Battery Charger Maintenance - No. L302AV
- Storage Battery Maintenance - No. L301AV
- Central Office Ground Maintenance - No. L401AV

Factory or On-Site Training School

Specialized Test Equipment
- Ringing Generator Test Set - Model LS2000
  (Includes loads, metering, digital frequency counter)
  Ringing Demand Test Set - Model LS5000
  (measures ring load current and voltage)
- 130V Converter Test Load - Model LS1000
  (Variable loads to 6 amps)

Power Evaluation Program (PEP)

- Power Analysis program for all central office power equipment including batteries.

Power Upgrade and Modernization Services

- Including engineering, fabrication and complete installation

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Spare Parts Kits and Fuse Kits
Handy and Practical, helps keep down time to a minimum.

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Return to: LORAIN SERVICE
1122 F Street
Lorain, Ohio 44052

_____ Audio Visual Training Programs

_____ Factory or On-Site Training

_____ Model LS5000 Test Set

_____ Model LS2000 Test Set

_____ Model LS1000 Test Set

_____ Power Evaluation Program (PEP)

_____ Power Upgrade and Modernization Services (EF & I)

_____ Maintenance Contracts

_____ Spare Parts Kits and Fuse Kits

COMPANY NAME: _____

ADDRESS _____

CITY, STATE, ZIP _____

ATTN: _____ TITLE: _____

TEL. NO. _____